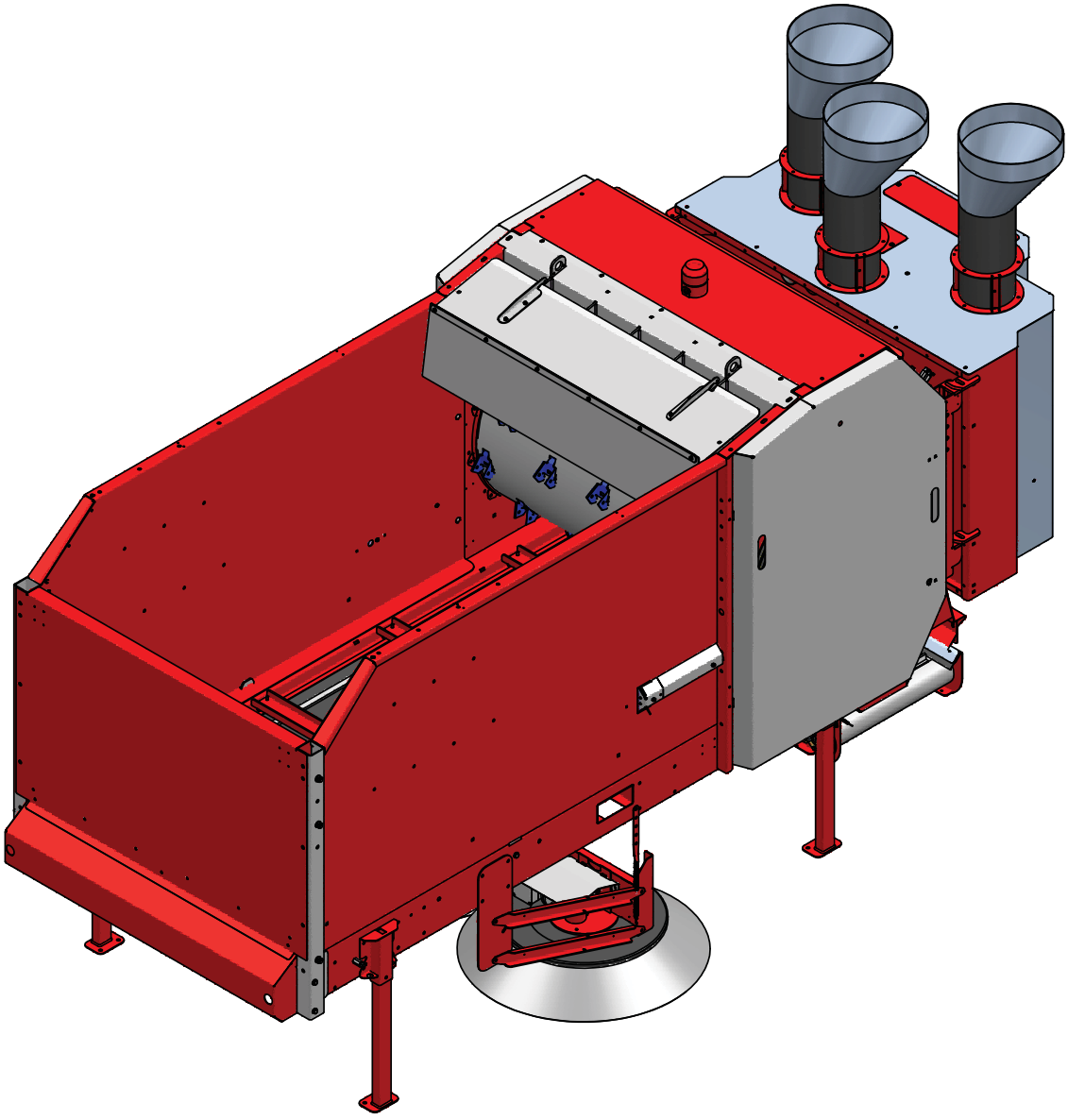
Operator's manual K2 FeedRobot



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1 General safety instructions

1.1 CE - Declaration of conformity

We,
T. Kverneland & Sønner AS,
Kvernelandsvegen 100
N-4355 Kverneland
Norway
declare that the product:

TKS - K2 FeedRobot

has been built in conformity with the Machine Directive (2006/42/EC) and meets the relevant fundamental health and safety requirements.

Kverneland, 1 December 2014

Tønnes Helge Kverneland
General Manager

Enter the serial number on the machine:

_____

T. Kverneland & Sønner AS, manufacturer of agricultural products, reserves the right to change the design and/ or specifi cations of its products without prior warning.
This does not imply any obligation to modify previously supplied machines.

1.2 Garantee

This TKS product is guaranteed against manufacturing and material defects for one year.
If the owner wishes a defect to be covered by the product guarantee, he or his representative must inform the dealer of this when ordering parts and/or repairs. Claims must be reported within the guarantee period.
The dealer must complete a claims form for each case covered by a guarantee and send it to TKS or TKS's distributor/importer within the 10th of the month following the one in which the defect was reported. The defective parts shall be marked with the claim number and be kept for up to 6 months so that TKS or TKS's distributor/importer can inspect them.
Since TKS products are used outside the manufacturer's control, we can only guarantee the product quality, and not that it will perform its function, nor are we liable for any resulting damage.

The guarantee is not valid if:

a) third-party spare parts are used, or the product is repaired or altered without the approval of TKS
b) the operating and servicing instructions have not been followed
c) the machine has been used for other purposes than those for which it is designed

The guarantee does not cover damage due to normal wear and tear
Official safety regulations specify requirements that apply to the manufacturers of this machine relating to the careful review of safety hazards that may arise when this type of machine is used correctly. Therefore, TKS and our importer/distributor are not responsible for the functioning of components that are not shown in the spare-parts catalogue for this product.
TKS reserves the right to change the design of the product without this implying any obligations in relation to previously supplied machines.

1.3 Introduction

Congratulations on buying your new TKS product. You have chosen a functional, high quality product. A network of helpful dealers will be able to advise you on its use, as well as provide servicing and spare parts.
All TKS products are designed, tested and built in close cooperation with farmers and machine workshops to ensure optimal efficiency and reliability.
Please read this instruction manual carefully and familiarise yourself with the machine's manner of operation before starting to use it.
Many different factors and variables can affect the performance and method of operation of the machine. It is therefore very important to assess all known factors and adapt the way in which the machine is used accordingly. A good understanding of the machine's method of operation and performance, together with a sound knowledge of feeding and feed types/consistency will ensure the best results.

By being thorough and making the necessary adaptations to local conditions, you will ensure the best possible results.

Yours faithfully
T. Kverneland & Sønner AS

T. Kverneland & Sønner AS,
Kvernelandsvegen 100
N-4355 Kverneland
Norway

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1.4 Technical data K2 FeedRobot

1.4.1 Model description and area of use

The K2 FeedRobot system is designed and built for automatic dispensing of silage, round bales, square bales and most types of forage, as well as frozen feed.
The consistency and properties of the feed will impact the functionality of the machine, which is why it is important to experiment with the machine to find the best possible operating pattern based on your own circumstances.
Certain types of feed can be difficult to run automatically, and in certain cases it may be necessary to run it through manually.

The K2 FeedRobot system must be seen as a system and not just as a device. The basic thought behind it is that the large herds of livestock kept these days consume so much feed that there is a need for a system to take care of both automatic supply and dispensing. The system comprises a K2 FeedRobot, which can move automatically through a variety of programs in which it performs various tasks, and one or more
intermediate storage units where the K2 FeedRobot can automatically supply itself with feed.

The K2 FeedRobot system can be installed in most farm buildings, and it is also versatile, given that it is both tall enough and wide enough to pose no threat to animal or human safety. The system can be equipped with a variety of additional components, such as
a concentrated feed tank, weighing cells, a single or double-rail suspension or a gate opener.

In order to get the system stable and reliable, it is important to thoroughly familiarise yourself with how it works.

NB! The instructions given in this operator's manual apply to standard operating conditions. Individual circumstances may arise at the premises of the user that deviate from the instructions provided here.
Changes to the machines and equipment as a result of such circumstances shall not be grounds for making a claim against the manufacturer or supplier.

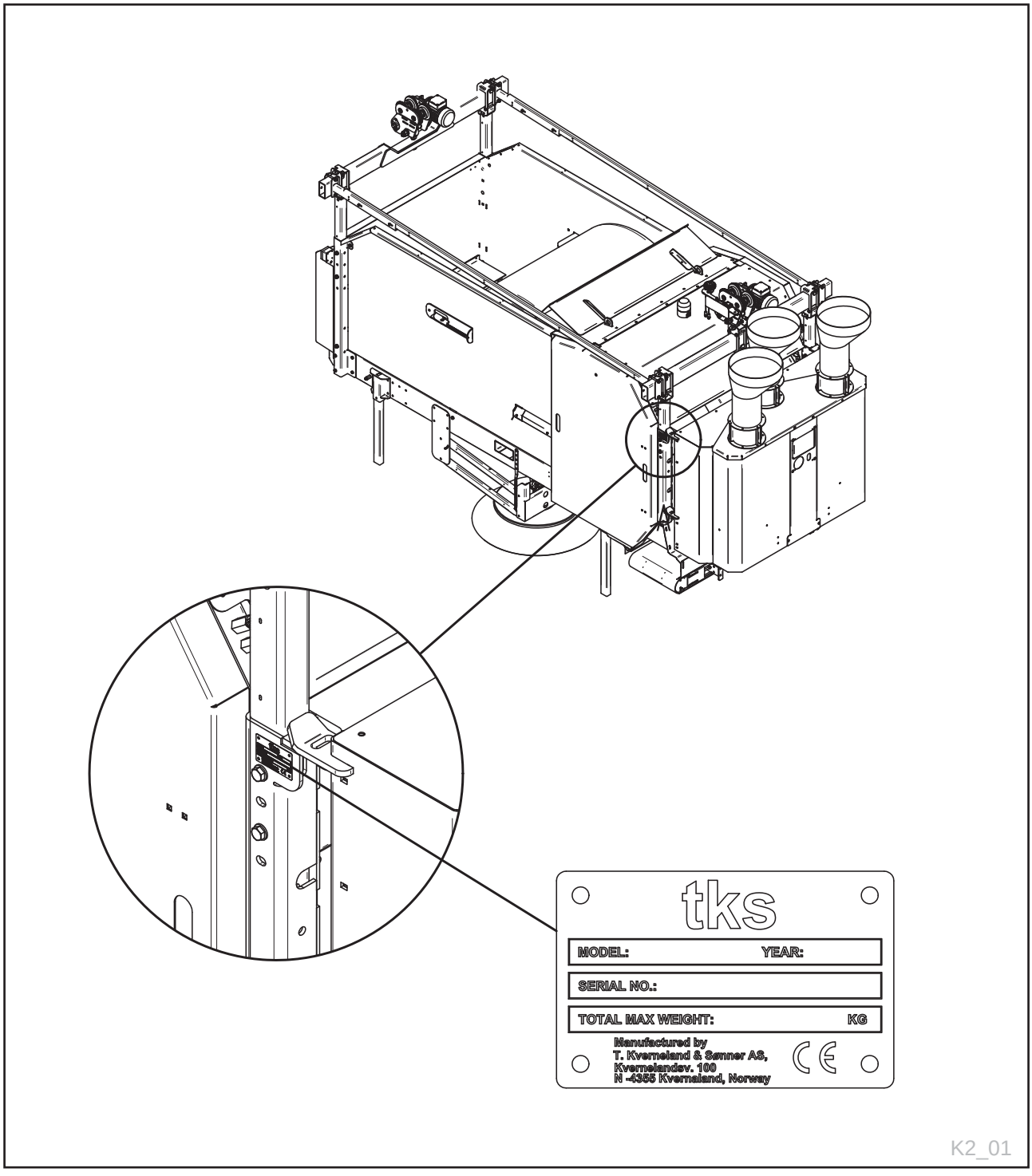
Climate, temperature, grass types, time of cutting, cutting/pressing equipment and conservation methods are some factors that may affect the functionality and performance of the machine.
It is important to adapt and adjust the machine to suit local conditions.
This is important to achieve the best possible result.

Chapter 1 describes the assembly of the K2 FeedRobot and the functions of its individual components.

Extra equipment:
Cross conveyor 1,0m - 1,3m - 1,7m
Double FeedBrush
Section extension - wide and narrow
Pendant control
Concentrated feed tank (1 or 2 tanks 1200) - (1-2 or 3 tanks 1600)

1.4.2 Machine identification

The machine's serial number and the manufacturer's address are written on a plate on the machine. See the illustration on this page. The machine's serial number and the delivery year should be written below.
Please use this information when making any enquiries about spare parts or servicing.
This product is CE marked. This mark, along with the associated written EU confi rmation, means that the product fulfi ls current health and safety requirements, and complies with the following directives: Machine Directive, 2006/42/EC.

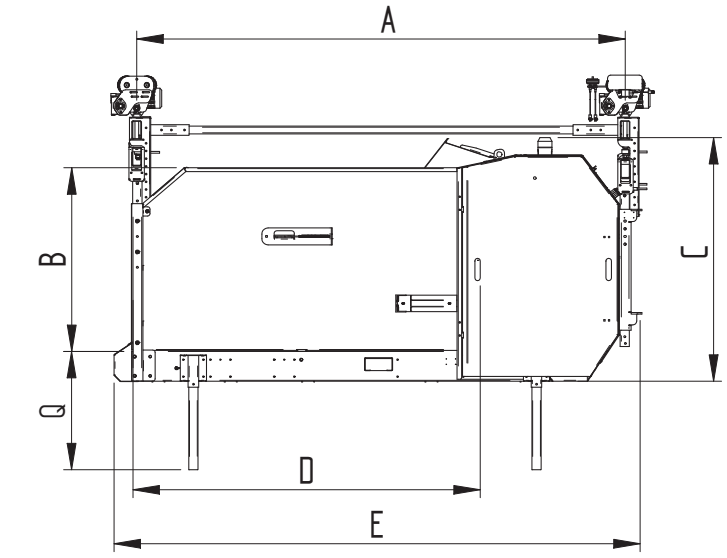


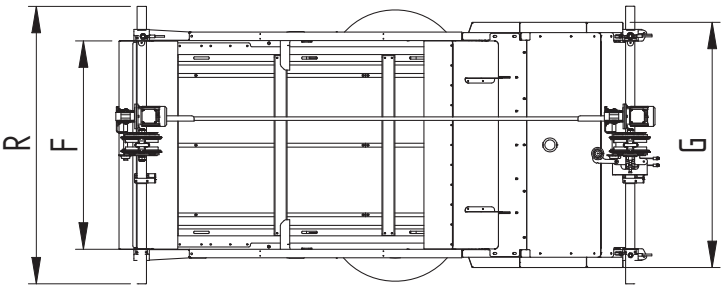
1.4.3 Technical data K2 FeedRobot

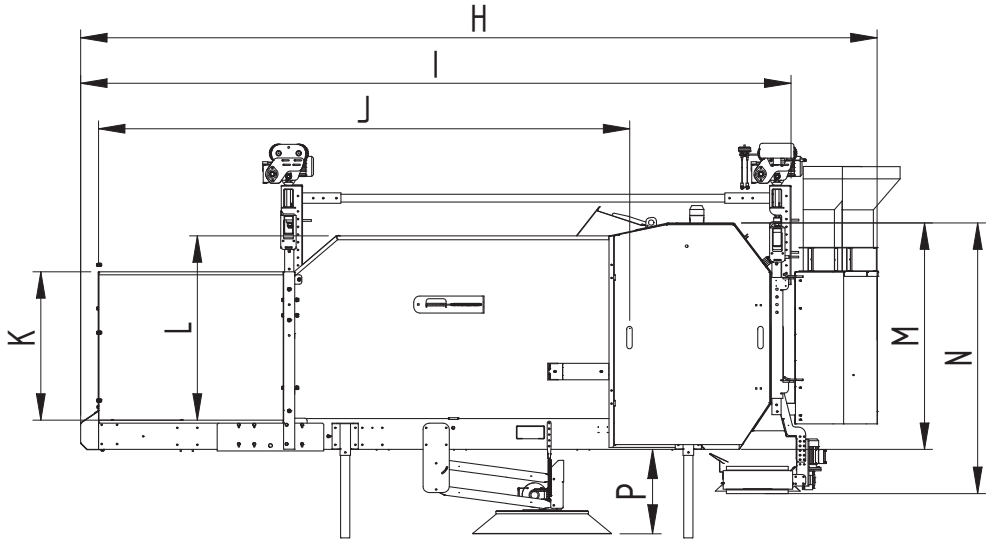
WEIGHT:	**1650 Kg**	
CONCENTRATE FEED TANK:	**120 L**	
DIMENSIONS		MM
LENGTH (MAX)	SEE SIDE 12 OG 13	MM
WIDTH (MAX)	SEE SIDE 12 OG 13	MM
BOX WIDTH (INTERNAL)	2180 (3180)	MM
MAXIMUM BALE DIAMETER	1400/1600 (STRAW)	MM
MAXIMUM BALE DIAMETER	1400/1600 (STRAW)	MM
MAXIMUM BLOCK HEIGHT	1200	MM
MAXIMUM BLOCK WIDTH	1200	MM
MAXIMUM BLOCK HEIGHT	1400 (2400)	MM
SPEEDS		
MAXIMUM SPEED ON RAILS	0,61	M/S
SHREDDER DRUM SPEED	120	RPM
BELT SPEED SIDE DISPENSER STD.	0,6	M/S
BELT SPEED SIDE DISPENSER EXTRA THROW	1,2	M/S
POWER		
SHREDDER DRUM 230V	7,5 kW	27A
SHREDDER DRUM 400V	7,5 kW	18A
RIVERTROMMEL 400V	7,5 kW	18A
SIDE CONVEYOR 230V	0,9 kW	4,5A
SIDE CONVEYOR 400V	0,9 kW	2,5A
ON RAILS 230V	0,4 kW	2,5A
BRUSH 230V	0,4 kW	2,5A
BRUSH 400V	0,4 kW	1,4A
CONSENTRATE AUGER 24V	24V	42W
ELECTRICITY		
CONTROL CURRENT	24	V (DC)
PLS	SAIA PCD M 3330/3230 PLS	
DISPLAY	E150/NY TYPE E1071	
VOLTAGE	230/240	V (N/BY 400V)
VOLTAGE TOLERANCE	+/- 10%	
CURRENT CONSUMPTION 230 V	39,64 RATED CURRENT TOT	RECOMM. FUSE 42A
CURRENT CONSUMPTION 400 V	27,04 RATED CURRENT TOT	RECOMM. FUSE 30A
GENERAL		
NAVITAGION SYSTEM	PULSE WHEEL WITH INDUCTIVE SEN-	
FILL INDICATOR - COARSE FEED	PHOTOCELL	
FILL INDICATOR - CONCENTRATES	CAPACITIVE SENSORS	
FEED INDICATOR - CONVEYOR BELT	SHREDDER DRUM MEASUREMENT	
QUANTITY INDICATOR	CEILING RAIL LOAD CELLS	
TEMPERATURE WORKING AREA	-20OC / +50OC	

1.4.4 Main dimensions – K2 FeedRobot 1600

All measurements are in mm.







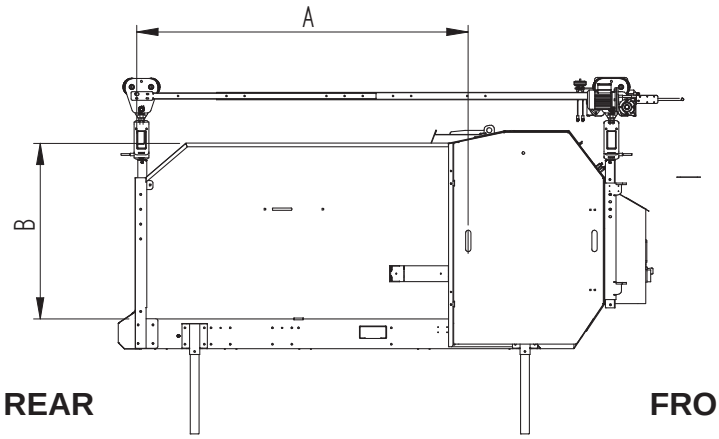
	MM	
A	3170	TROLLEY
B	1185	INTERIOR
C	1580	HEIGHT
D	2250	INTERIOR
E	3422	EXTERIOR
F	1354	INTERIOR
G	1590	EXTERIOR
H	5167	EXTERIOR 1M SECTION + TANK
I	4624	EXTERIOR 1M SECTION
J	3448	INTERIOR1M SECTION
K	952	INTERIOR
L	1185	EXTERIOR
M	1470	INTERIOR
N	1755	MASHINE + ELEVATOR
P	550	WORKING HEIGHT BRUSH
R	1800	WIDTH OF BOOM

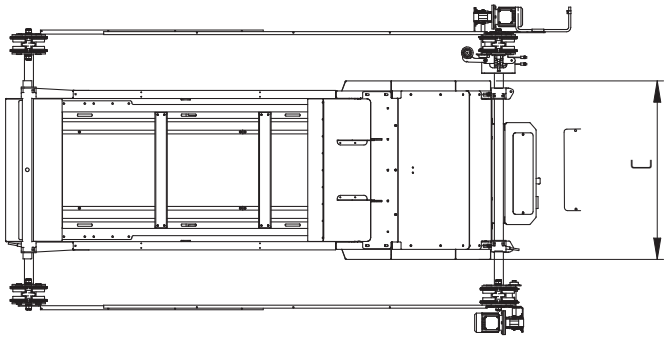
K2_02

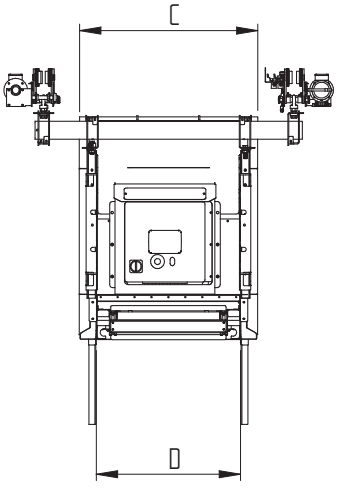
1.4.5 Main dimensions – K2 FeedRobot 1200

All measurements are in mm.

	MM	
A	2244	INTERIOR
B	1202	INTERIOR
C	1202	EXTERIOR
D	964	INTERIOR







K2_14

1.5 Safety

Please pay particular attention to this symbol. It designates a safety risk, and describes precautions that must be taken to avoid accidents

Before operating, adjusting or repairing the machine, the user, technician or owner should familiarise himself with the safety instructions contained in this installation manual.
Safety at work is your responsibility!

1.5.1 General safety instructions

Please read and understand these general safety instructions.

There is a risk of stones being thrown upwards and backwards when the machine is in operation.

Use of the machine
The machine must only be used for the purpose for which it is designed.

The machine's method of operation
The operator must familiarise himself with the machine's method of operation and function so that the machine can be used in a safe and appropriate manner.

Providing notification in the barn
The operator must familiarise himself with how the machine works and functions, so that it can be used safely and properly

Keep a safe distance
Humans and animals must be kept away from the machine when it is in operation.
Keep your distance from working, rotating and moving parts.

Be safety conscious
Never enter the machine when it is in operation.
When performing maintenance, disconnect the power supply.

Be safety conscious
Never enter the machine when it is in operation.
When performing maintenance, disconnect the power supply.

Warning lights
Warning lights installed on the machine must be visible from all areas of the barn.

Alarm
Ensure that the installed alarm sounds
15 seconds before start (delayed start).
Do not enter the area between the reservoir and the machine before filling.

Warning sign
The supplied symbolic warning signs
"No access for unauthorised persons" be attached to all doors into the barn.
Attention! The machinery starts automatically.

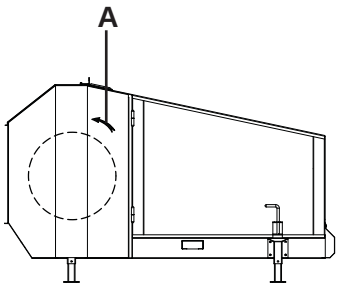
Spare parts
For safety reasons we recommend that you only use original spare parts. The use of third-party spares invalidates the product guarantee.

Maintenance
Ensure that the machine is properly maintained and is kept in good condition. Never attempt to change the mechanical workings of the machine.

The area in which the machine is operating
Must be physically sealed off or locked to prevent danger to humans or animals.

Control panel
The power supply must be cut off before opening the panel.

Emergency stop
The round signal yellow STOP stickers are to be attached to all emergency stop switches.



Direction of rotation
KlisterArrow (A) indicates the roller's direction of rotation.
The sticker indicating the direction of rotation on the roller is placed on the left side.

NB!
If the direction of rotation is not correct, two phases on the main power supply must be swapped.

1.5.2 Additional safety instructions

The machine is marked with a warning signs. If these signs are damaged, they must be replaced. The order number is shown on the illustrations in this section.

Fig. 6 for their location on the machine

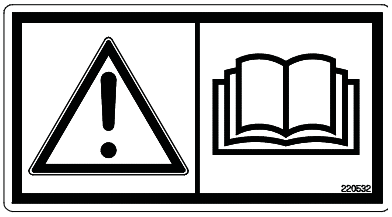


Fig. 1

Warning sign UH220532 (Fig. 1)
Ensure that you read and understand the instruction manual before using the machine, and before making any adjustments or performing any maintenance.

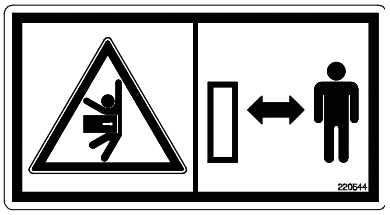


Fig. 2

Warning sign UH220544 (Fig. 2)
Risk of crushing injury. Keep a safe distance from the area between the Kombikutter and reservoir.

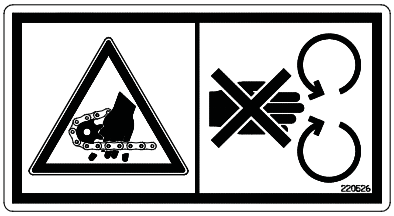


Fig. 3

Warning sign UH220526 (Fig. 3)
You may damage your fingers if you trap them between the chain and the chain wheel.

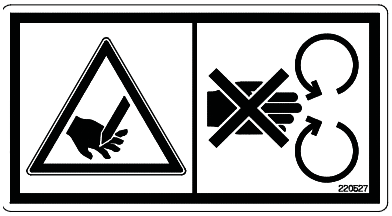


Fig. 4

Warning sign UH220527 (Fig. 4)
Risk of cutting your hand. There is a risk of cutting your hand on the drum's knives when the drum is in operation

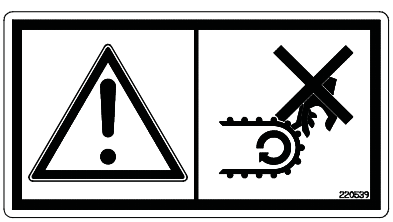


Fig. 5

Warning sign UH220539 (Fig. 5)
Risk of breaking your fingers. You risk breaking your fingers if you trap them between the conveyor and the base

1.5.3 Overview of safety risks

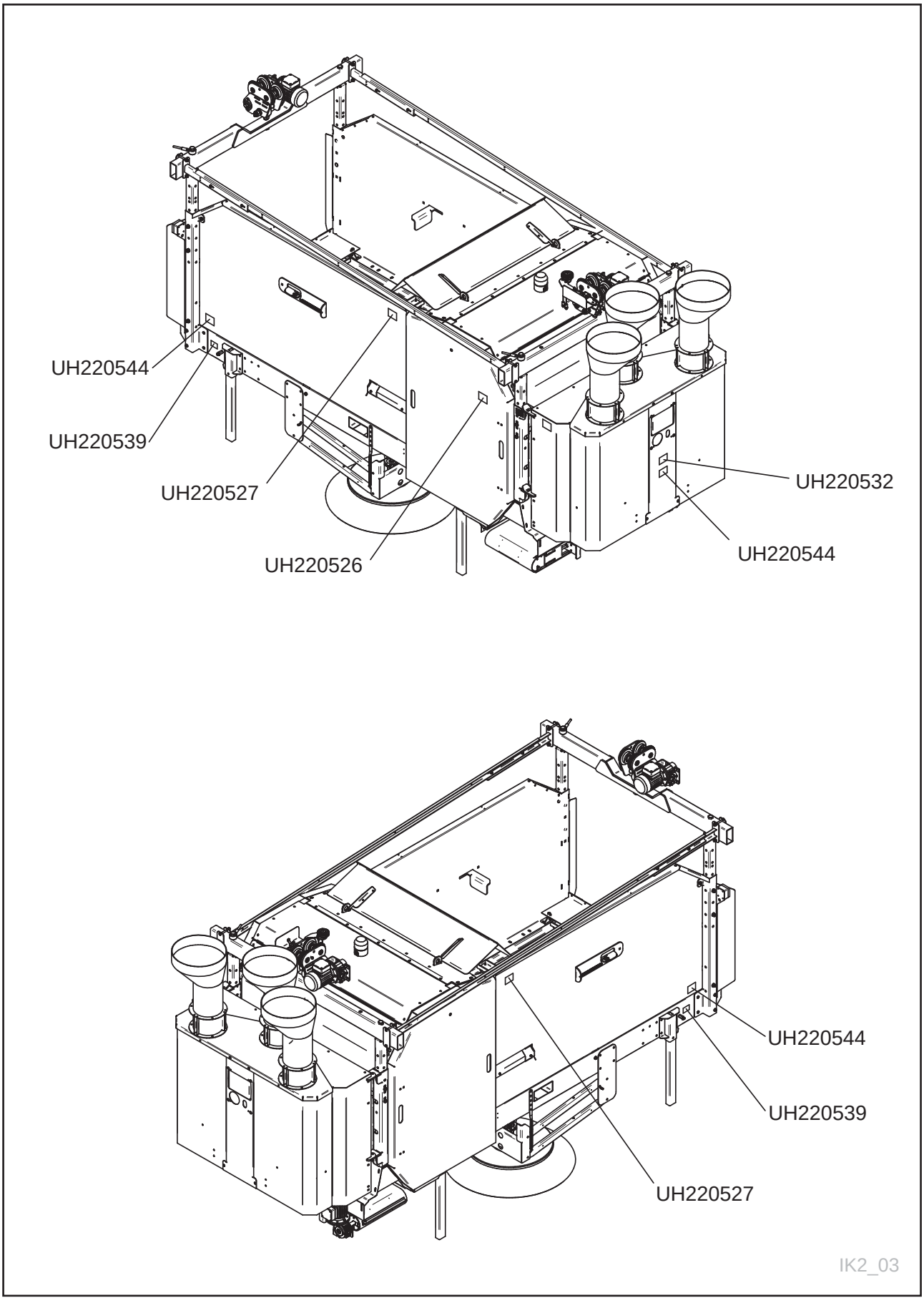


Fig. 6

1.5.4 Lifting the machine with a crane

Only use approved lifting equipment.
The machine must be lifted from the points marked with a lifting symbol. **See Fig. 7**

Caution!
Ensure that no-one is under or close to the machine when it is being lifted.
Lift the machine using a strap attached to the main frame of the machine, so that the lift is balanced.
Check that the straps are properly fixed before starting the lift.
Use an extra strap to help keep the machine in position.

1.5.5 New machine caution

Read the operator's manual
Be particularly careful when starting a new machine for the fi rst time. Installation faults, incorrect operation, etc. may lead to expensive repairs and loss of earnings. The TKS product guarantee does not cover damage resulting from failure to follow the recommendations contained in the instruction manual. Please pay particular attention to this symbol.
It is used to highlight important information, to help prevent incorrect installation and Operation

Pay particular attention to the following when commissioning a new machine:
Check that the machine is correctly installed and that it is not damaged.
Lubricate the machine where shown on Fig. 80 in Section 4 on Maintenance

Remember that the operator has a responsibility to ensure that your product is properly and securely installed.

1.5.6 Lifting point

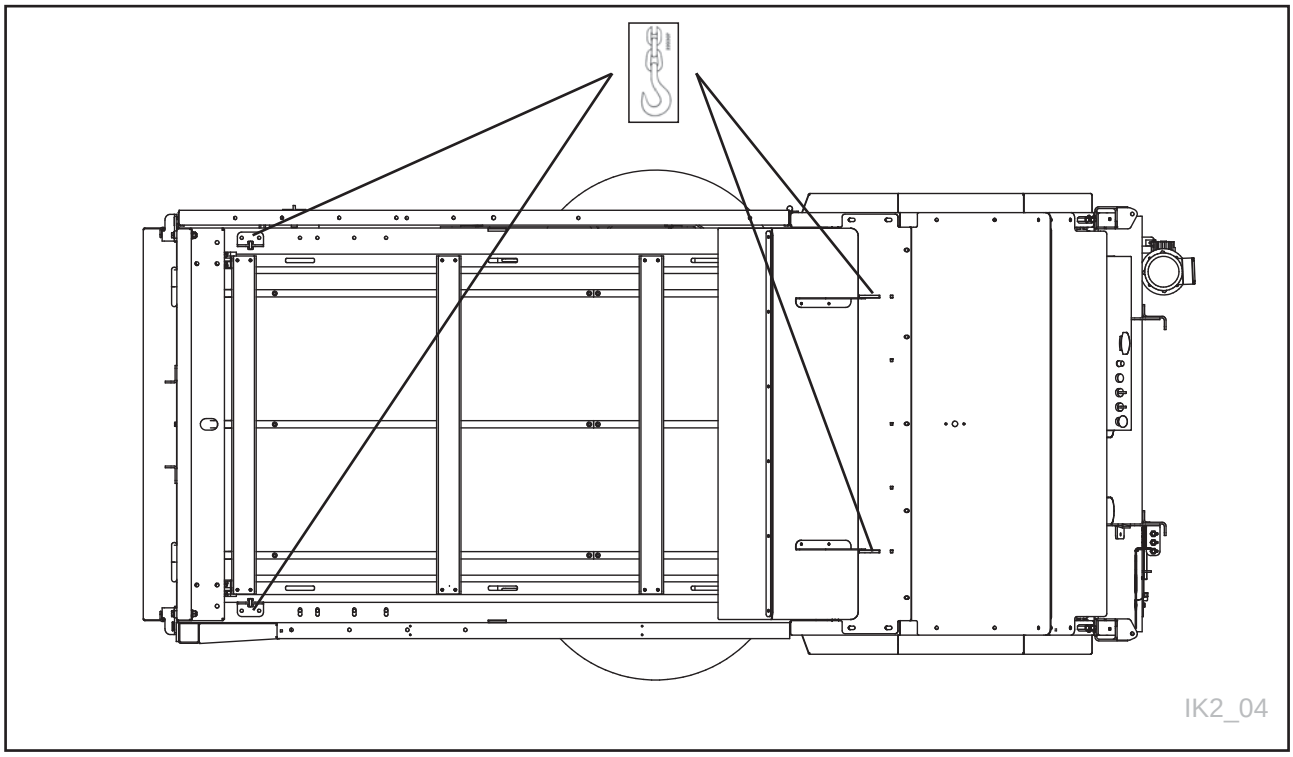


Fig. 7

1.5.7 Door-lock mechanism

LIFT THE LOCK to open the door!

Fig. 8

1.6

Recycling
- waste to resource -

TKS's products rely on electrical and electronic components in order to work.
These fall under the generic term of EE products. TKS's products use typical components such as cables, switches, motors, control units, etc.

When TKS products are thrown away those components containing contaminants should be treated and sorted in such a way that they do not pollute the environment. Contaminants should be taken care of safely.

Distributors are obliged to accept EE waste from products in the range of goods they sell.
This waste should be kept safe and sent on to an approved waste recipient or treatment plant.
EE waste must be sorted and transported in such a way that it is not damaged or destroyed.
If you need further information on the treatment of EE waste, please contact your distributor.

TKS is a member of Renas.
(National program for the collection/treatment of electrical/electronic waste)

Regards
TKS AS

2 Installing guidance

2.1 Recommended rail sizes on 1-rail suspension

Rail size	Length between portal
IPE 120	Length between portal
IPE 160	Max 3,5 m
IPE 220	Max 5,0 m

2.2 Recommended rail sizes on 2-rails suspension

Rail size	Length between portal
IPE 120	Max 3,0 m
IPE 160	Max 5,0 m
IPE 220	Max7,0 m

For andre skinne portaler, ta kontakt med tks.

Torque for K80 bolts (8.8)

M6	M8	M10	M12	M16	M20	M22	M24
1,1 Nm	2,8 Nm	5,2 Nm	9,1 Nm	22,6 Nm	44,0 Nm	59,7 Nm	76,0 Nm

Important notes regarding assembling of TKS' monorails

- The rail must be dimensioned to accord with the load (P) and the suspension distance (I), and Must be checked for any wheel pressure restriction.
- The building structure must be able to bear the load of the rail system in question.
- The TKS rail system comes with full strength in the joints (IPE120/160).

When TKS rails are used in rail tracks, most of the attachment points must be on the lower face of the rail. For rail tracks with a bend, there must be a suspension at the beginning, middle and end of the bend.

Important:
It is important to regularly check the tightening torque of bolt connections.
(at least once a year).

2.3 Installing a ceiling-mounted

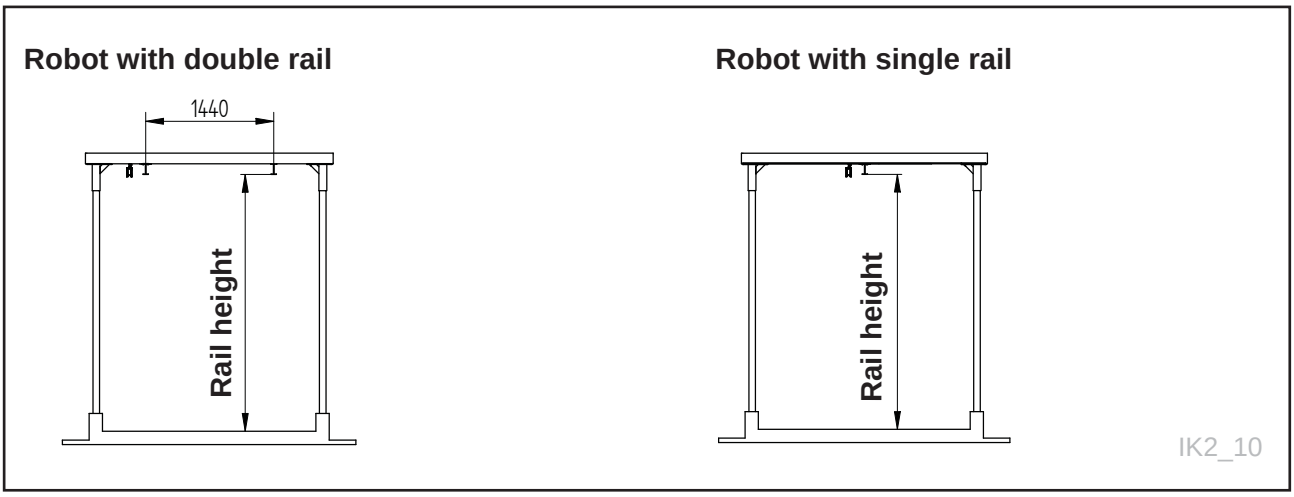


Fig. 10a

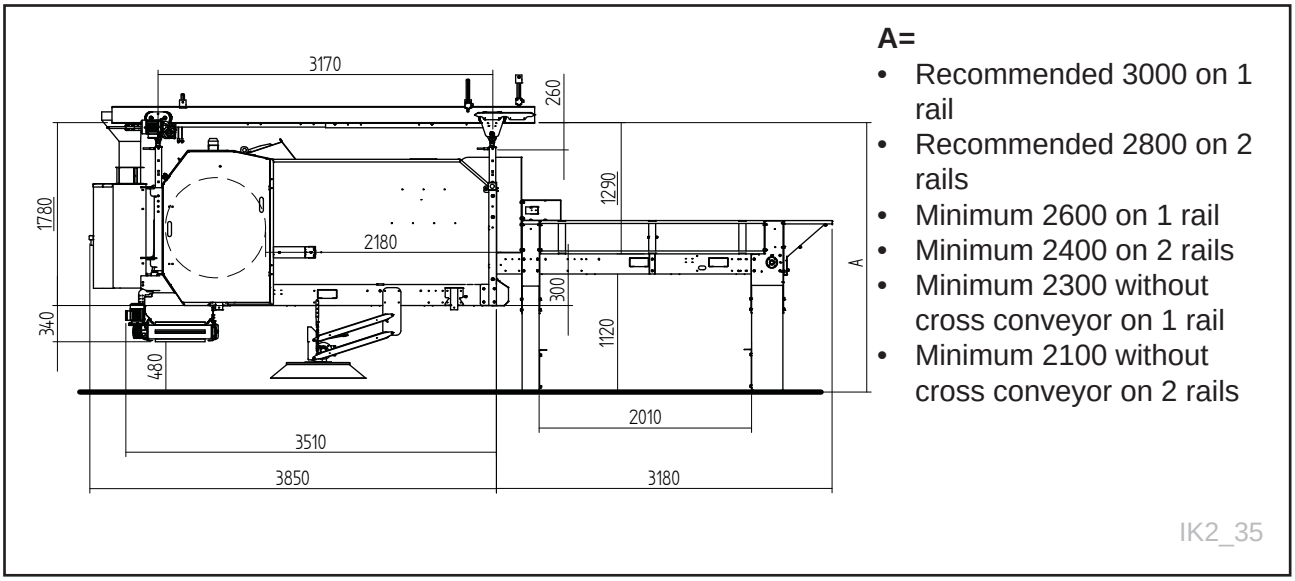


Fig. 10b

Height under rail (minimum measurement)	Rec. measure	Filling from reservoir	Manual/other filling	Without cross conveyor
K2 FeedRobot on 2 rails	2800	2400	2050	2050
K2 FeedRobot on 1 rails	3000	2600	2200	2250
Width from cradle edge-cradle edge		**Min. width**	**Max. width**	
K2 FeedRobot 1200		1600		
K2 FeedRobot without cross conveyor		2000	-	
K2 FeedRobot 1600 1,0m cross con-		2000	2400	
K2 FeedRobot 1600 1,3m cross con-		2400	3000	
K2 FeedRobot 1600 1,7m cross con-		3000	4000	

2.4 Installing the power supply

The most common and best method of supplying power to a K2 CombiCutter is to use powered rails. These consist of a rail with a copper strip on the inside, and a transformer (slide) that follows the unit during operation. **Se Fig. 11**

The narrow fixing must be attached every 2 meters on the rail. **See Fig. 11b**

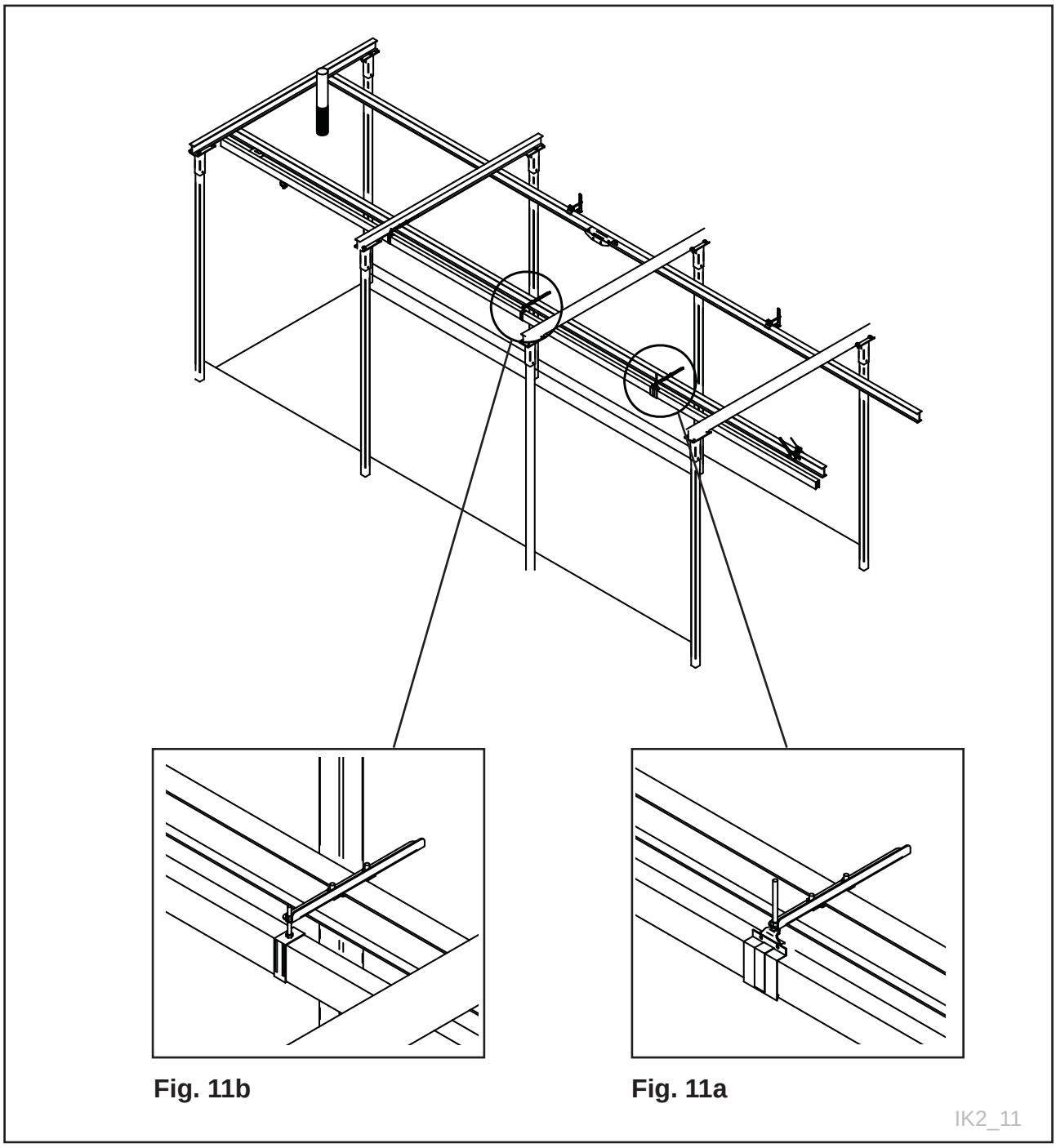


Fig. 11b **Fig. 11a**

IK2_11

Fig. 11

The wide fixing must be attached at the correct distance from the rail holding the traverse carriage.

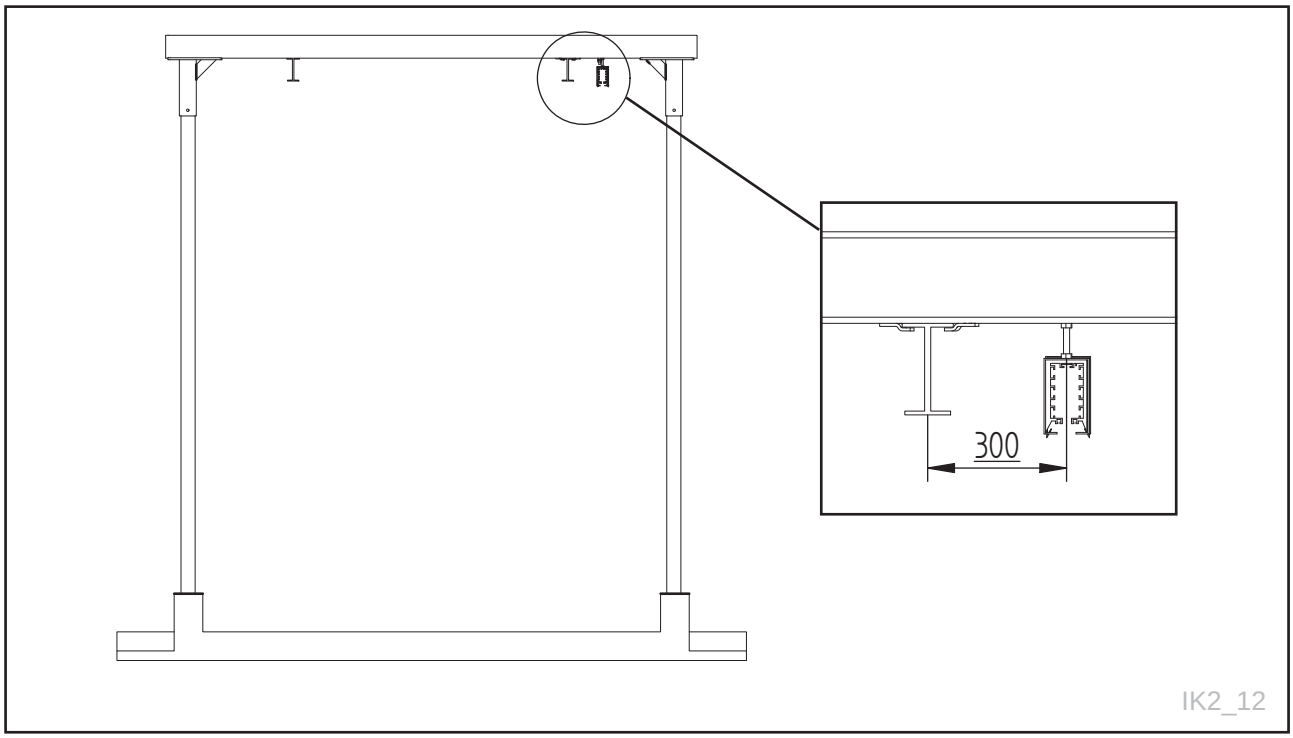


Fig. 12

2.5 Copper wires 400V/230V

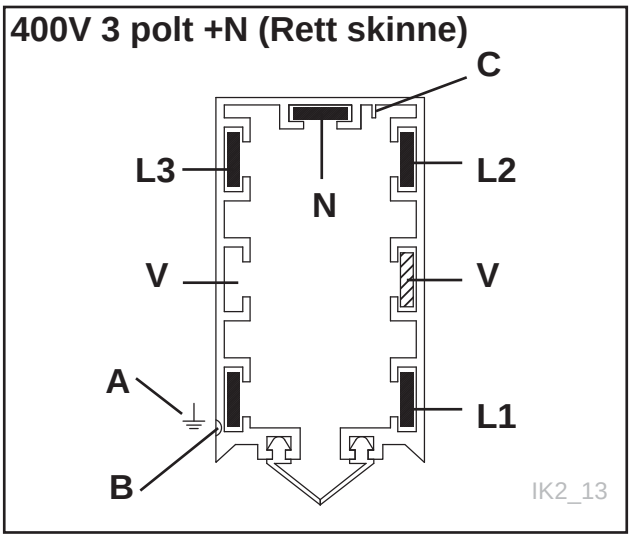


Fig. 13a

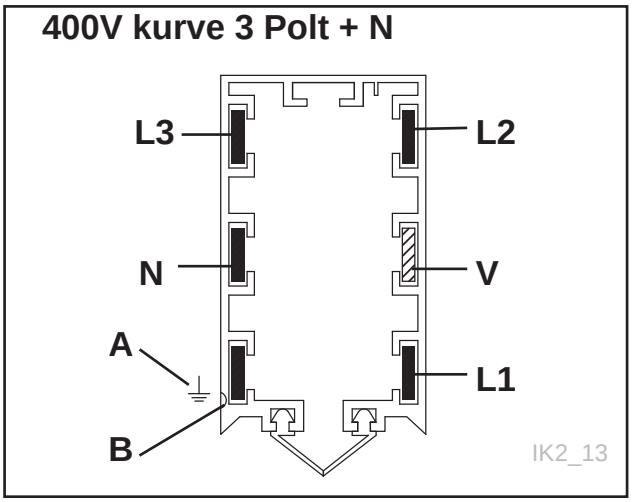


Fig. 13b

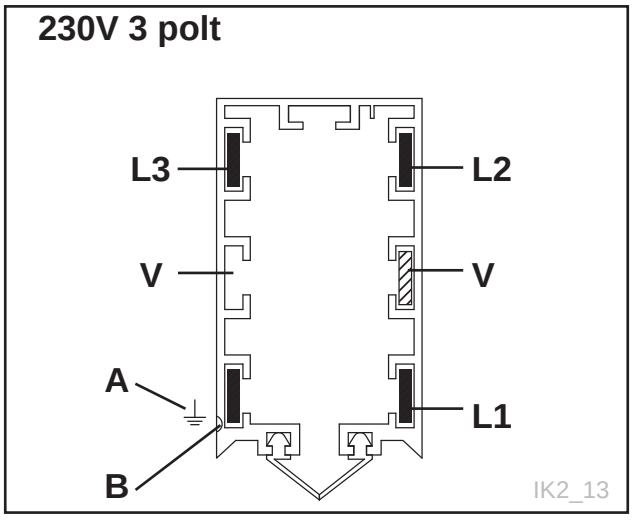


Fig. 13c

The earth **(A)** should be inserted where there is a yellow stripe (B) along the outside of the rail. The yellow stripe should be continuous along the entire length of the rail.

⏚ **= GROUNDED**
L1 = PHASE
L2 = PHASE
L3 = PHASE
N = NEUTRAL CONDUCTOR
V = HEATING

An additional safety bar (C) on the rail ensures that the current collector cannot be installed the wrong way around and cause a short circuit or incorrect impulses.

Each copper wire should be fixed to the tightening screws in the switch box at the end, before an **authorised electrician** completes the rest of the process.

Incase of humid locations or temperaure fluctuations, heat trace cable should be installed.

Also consult the conductor rail manual.

NB!
TKS recommends using heating cables as they are more reliable.

400V 3 polt+N (Straight rail)
400V curve 3 Pole + N
230V 3 pole

2.6 Installing the conductor rail

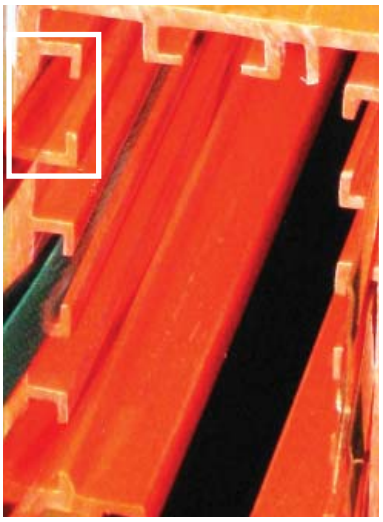


Fig. 14

PVC-rail

The rail has 7 tracks for laying 2, 3, 4, 5, 6 or 7 copper conductors.
Temperature range for the rail: -30°C to +60°C
The rail is made from fireproof plastic.
See Fig. 14

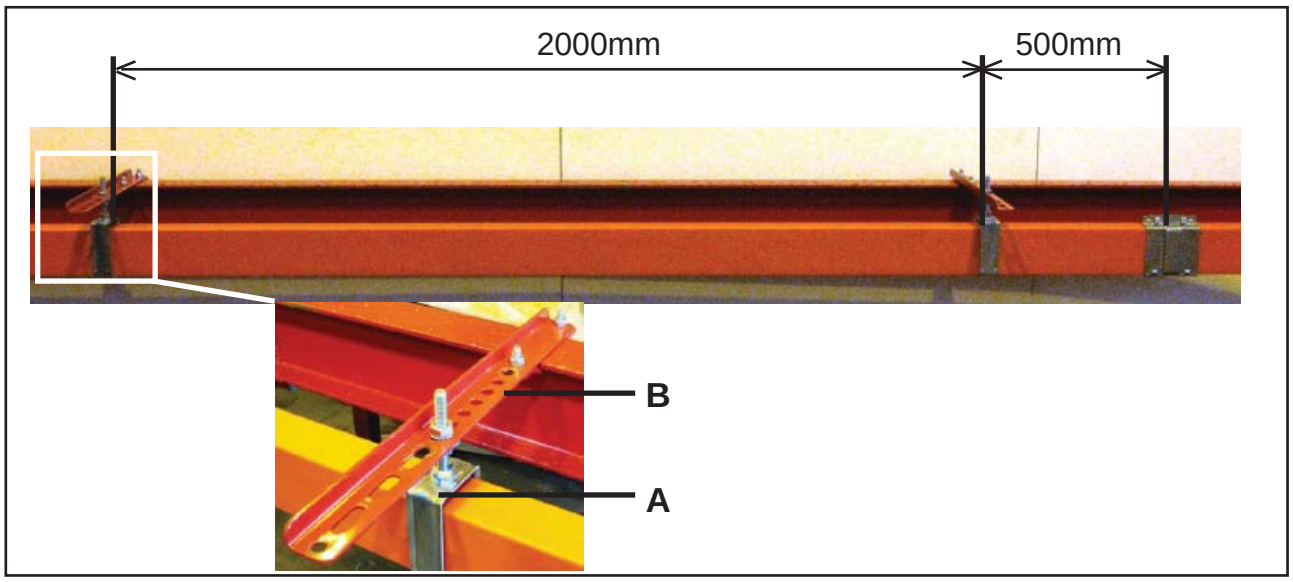


Fig. 15

Conductor rail

The rails can be used as conductors for all types of track arrangements, including curved tracks. The rail is fed into the gliding rail **(A)** which is fixed to an angle iron **(B)**, and is then fitted with clamps to the top of the I profile or directly onto the ceiling.
See Fig. 15

All conductor rail units must be fitted with the yellow line on the same side, otherwise the additional spacing strip will not fit. The extra rib prevents the current collector from being turned the wrong way.
Maximum 2000 mm distance between two suspension points.
Minimum 500 mm distance between sliding rail and joint.

Always fixed mount from the power connection point (end/middle connection point)
All other mounts must be sliding mounts. This is to allow the conductor rail to expand freely.

2.6.1 Conductor rail with end joint

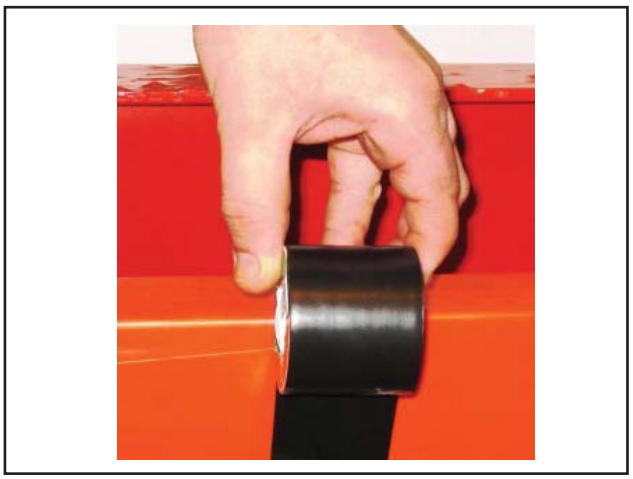


Fig. 16

T50 Isulation tape

Joints between two rail lengths should be covered with T50 insulation tape. **See Fig. 16**

Fig. 17

Joint clamp

The joint clamp is fitted with barbs that fix the rail into position when the two parts are pushed together. This enables you to join the conductor rail together quickly and safely.
Once the rail is in place we recommend that the current collector is laid through the rail to ensure that the joints are working properly, this must be done after the copper conductors are marked.
Check that the track along the rail is clear and not distorted by the joint clamps
(the track should be 10 mm). If necessary, you can adjust the track by bending the joint clamp until you achieve the required clearance.
See Fig. 17

Angel iron

The rail is fixed to an angle iron, which is then fitted with clamps to the top of the I profile or directly onto the ceiling.
See Fig. 18

Fig. 18

End joints

Move the sleeve to the end switch box at the end of the rail.
See Fig. 19

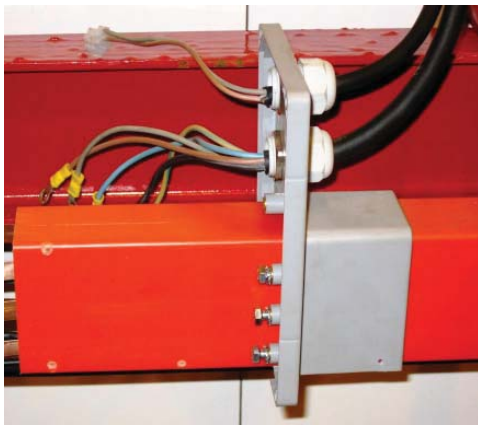


Fig. 19

Sleeve

Once the sleeve has been positioned at the end of the conductor rail it must be fixed using the appropriate screws **(A).**
The distance between end terminal box and fixed suspension should be 500 mm.

See Fig. 20

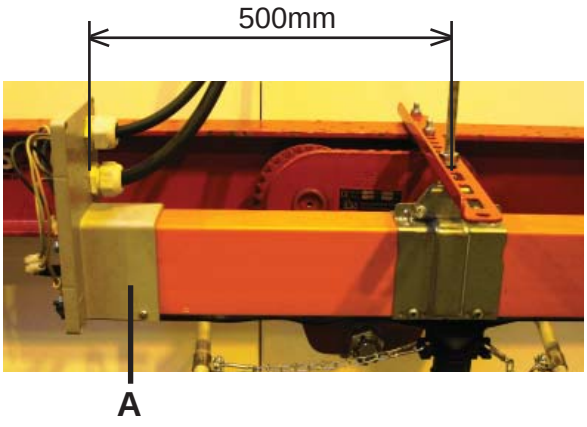


Fig. 20

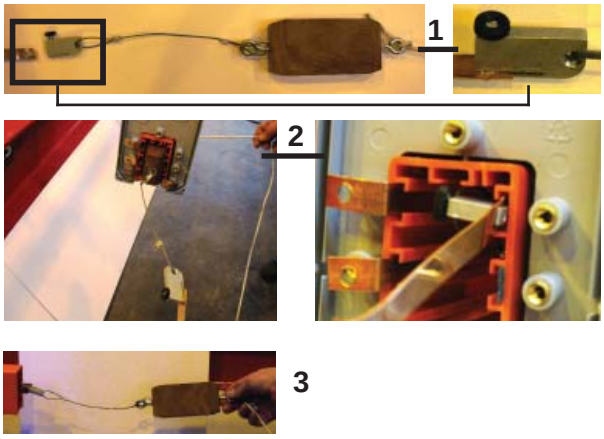


Fig. 21

Trolley

Lay the copper wire from the end of the track using a trolley.

Picture 1
Attach the trolley to a ø6 hole in the copper wires.

Picture 2 - 3

Feed the trolley into the conductor rail and pull it through the rail until it reaches the other side.
See Fig. 21

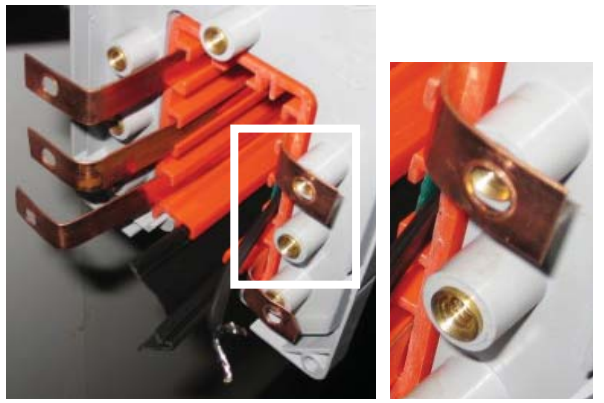


Fig. 22

Copper wires

The trolley pulls the copper wires through the conductor rail until the bent end pushes against the rail.
See Fig. 22

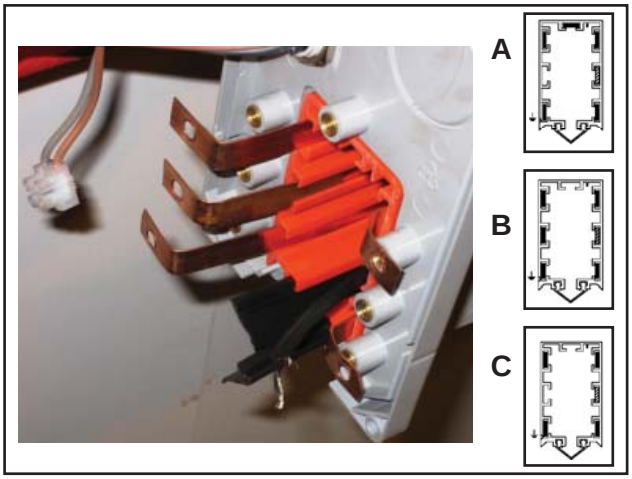


Fig. 23

Copper wire connections

The copper strips are then connected to the various currents and their associated wires.

See symbols and abbreviations for copper wires on page 29, Fig. 13a - 13b - 13c

A	400V 3 polt +N (Stright rail)
B	400V kurve 3 Polte+ N
C	230V 3 pole

See Fig. 23

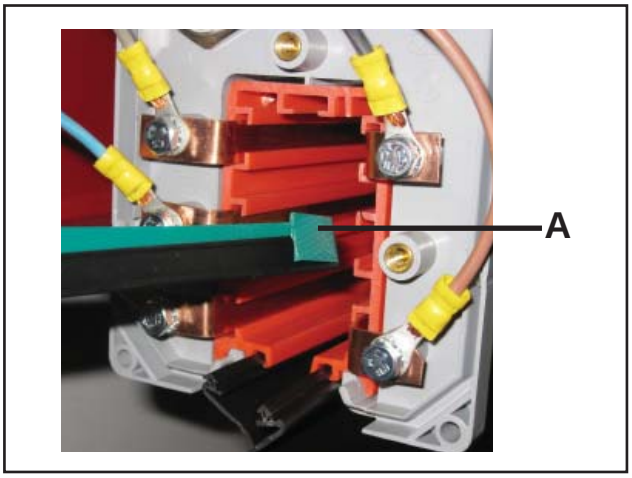


Fig. 24

Heating cables with insulation strips

VHeating cables with insulation strips are fed into the conductor rail.
The green insulation strip **(A)** must face inwards on the conductor rail.
See Fig. 24

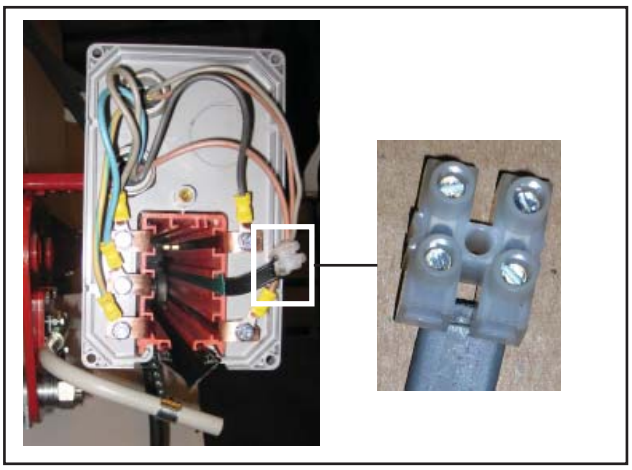


Fig. 25

Suspension clamp

The heating cable is connected to a terminal block with a 230V – 10/16A separate circuit.
See Fig. 25
At the middle junction box, the heating cable should be split in two and inserted into each end.
See picture below.

Suspension clamp

Fit the fixed suspension clamp (A) near the end joint.
See Fig. 26

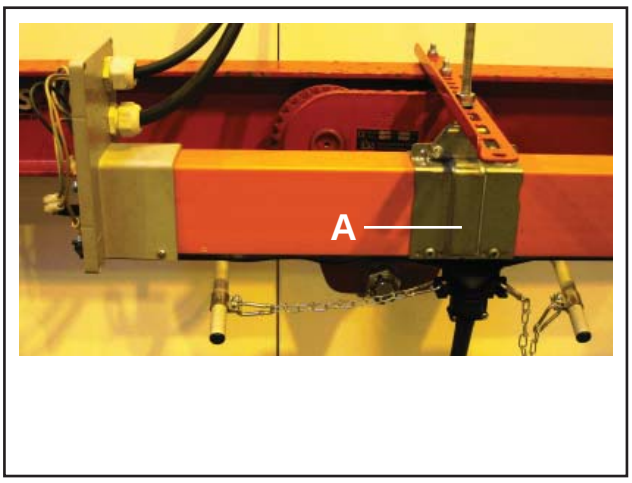


Fig. 26

Fig. 27

Fitting the rubber seal

Insert the protective membrane rail into the horizontal track underneath the conductor rail either manually or, in the case of long pieces of membrane, by using specialist equipment (consult TKS).
The rubber seal should be fitted to both sides to achieve a better enclosure rating (IP44)
See Fig. 27

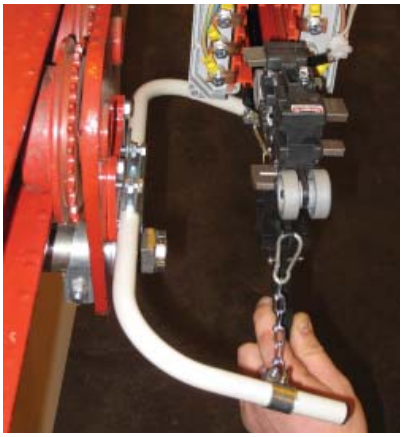


Fig. 28

Current collector

The current collectors are inserted into the casing on the conductor rail. The current collector is controlled by a link bracket attached to the traversing carriage or trolley.
Individual adaptation may be necessary depending on where it is located.

NB!
Ensure the cable does not pull the current collector trolley askew.
See Fig. 28

Fig. 29

Chain

On each bracket a chain should be fitted that will pull the collector horizontally. It is important that the chain pulls parallel with the opening in the conductor rail. See next picture.
See Fig. 29

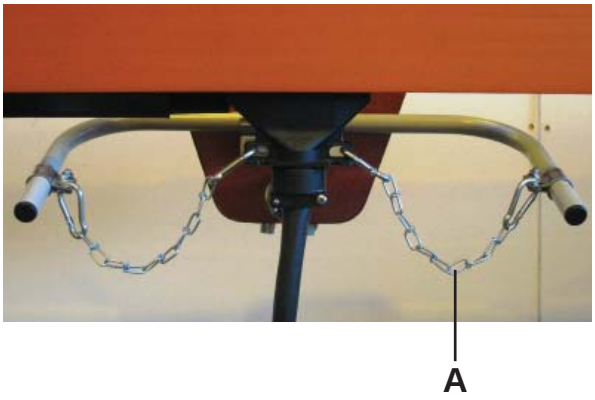


Fig. 30

Even pull on the chain

It is important that the chain (A) pulls evenly (not skewed) and slightly downwards (1–3 cm). This is particularly important when operating in curves.

See Fig. 30

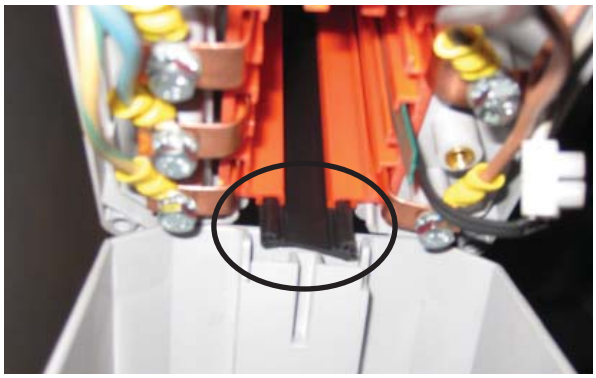


Fig. 31

Rubber seal

Ensure that the inserting part of the rubber seal is laid inside the track on the end casing.

See Fig. 31

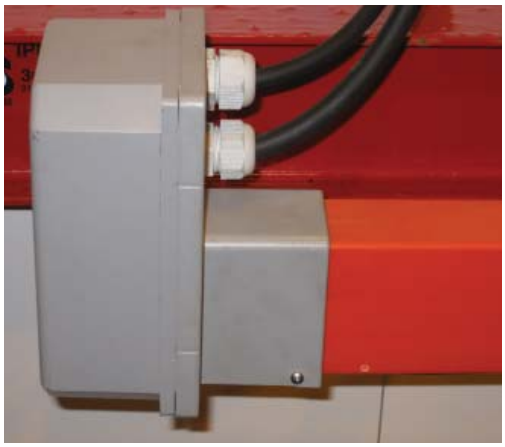


Fig. 32

End casing

Straighten the construction and fix the end casing using the appropriate screws.

See Fig. 32

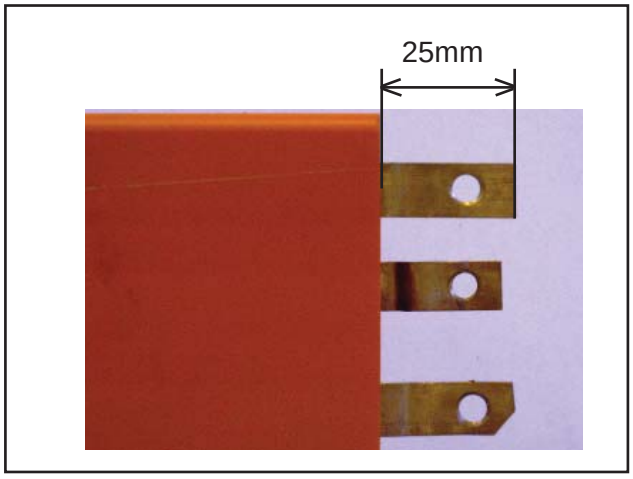


Fig. 33

Copper conductors

The ends of the copper conductors should be cut 25 mm outside the rail.
See Fig. 33

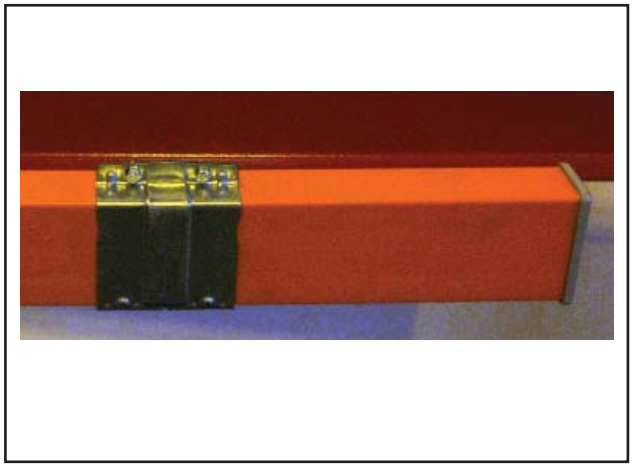


Fig. 34

Connector

Fit the end plug. Fix the joint clamp over the insulation tape and adjust it to obtain the required clearance.
See Fig. 34

2.6.2 Conductor rail with central connection

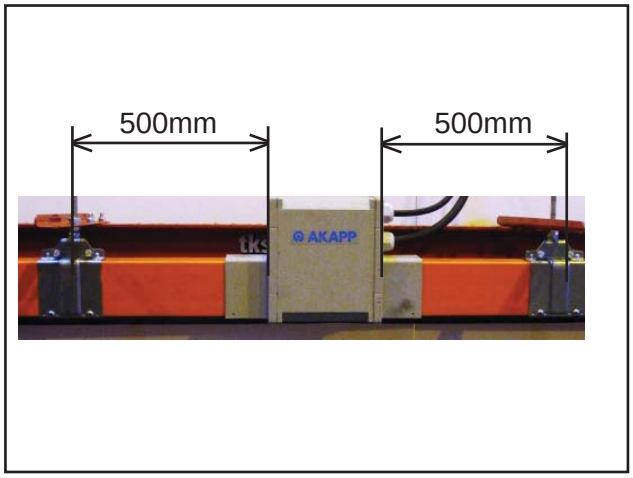


Fig. 35

Central switch box

Fit the central switch box with the sleeves from the box already inserted in both ends. Fit the central switch box with two fixed suspension clamps on each side.

NB!
A central switch box requires fixed suspension on either side of the supply box. A distance of 500 mm on either side is required.
See Fig. 35

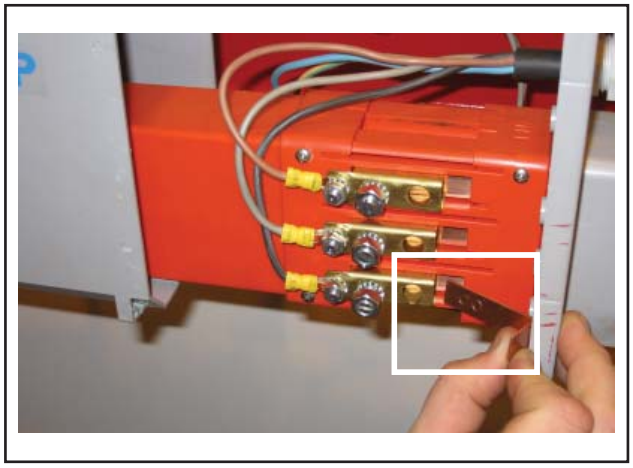


Fig. 36

Clamps

Connect the supply cable using clamps. Insert the clamp into the grooves
See Fig. 36

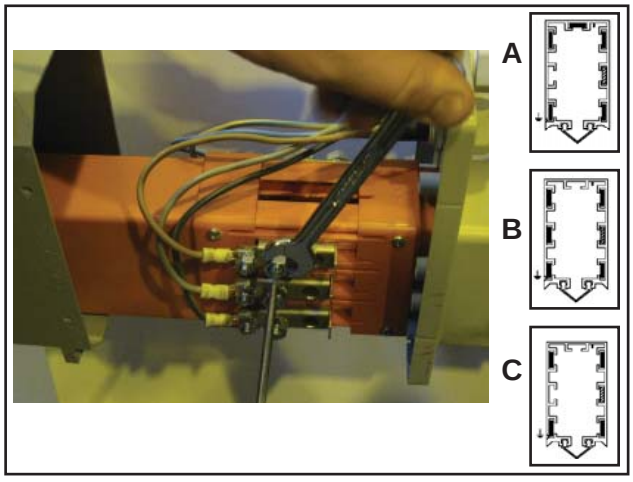


Fig. 37

Laying the copper conductors

The copper conductors are laid in the same way as for rails with end connections but can be done from either end.
See Fig. 37

NB!
Remember to feed the copper conductors through the connection clamps when laying the conductors.

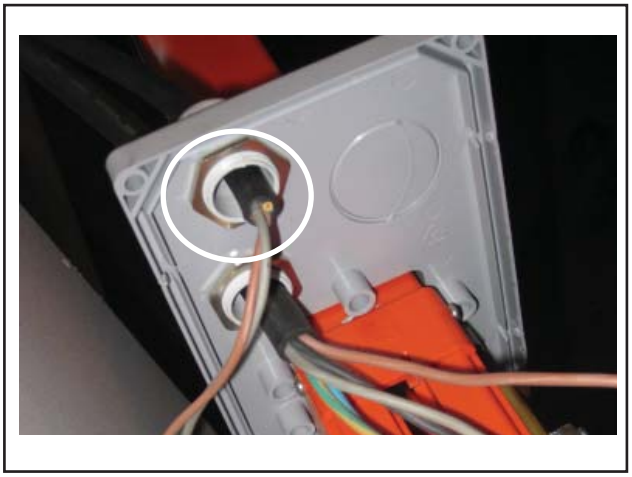


Fig. 38

Power supply

The supply cable should be connected using the appropriate screws. For power supply, connect the heating wires to a terminal block.
See Fig. 38

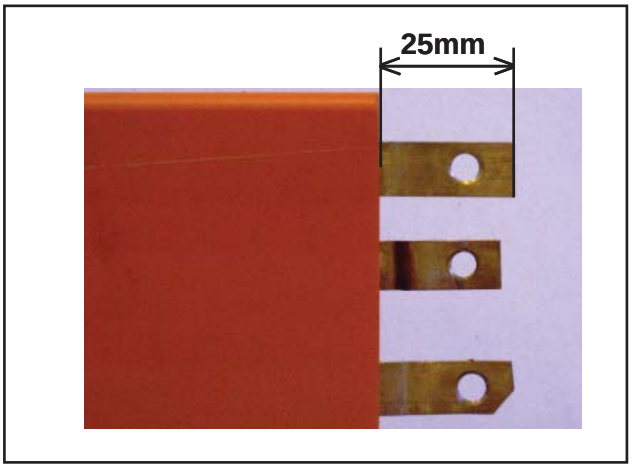


Fig. 39

Copper conductors

Just as for rails with end connections, the copper conductors that are fed through the conductor rail should be cut 25 mm outside the rail because of the expansion of the rail (during large temperature fluctuations).
See Fig. 39

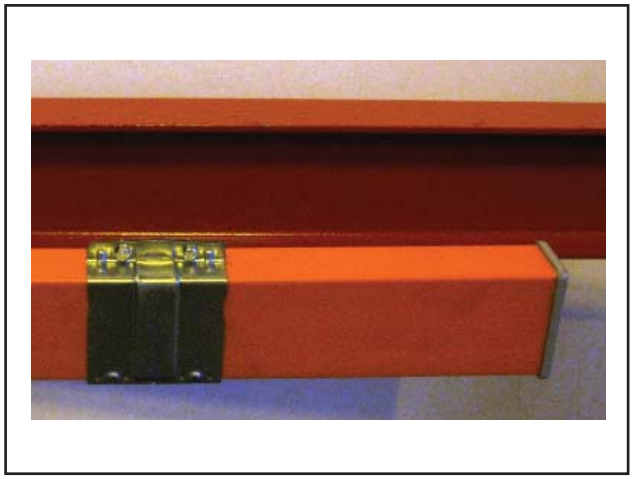


Fig. 40

Conductor rail end casing

After cutting the copper conductors to 25 mm, fix the end casing using the appropriate connector. This is the same procedure as for conductor rails with end connection.
See Fig. 40

Rubber seal

Insert the rubber seal by hand or use specialist equipment in the case of long pieces.
See Fig. 41

Fig. 41

Central switch box

The central connection should be fixed to the conductor rail using the appropriate screws.
See Fig. 42

Fig. 42

2.7 Installing traverser carriages

The traverser carriages for the cart are supplied loose. These are attached from the end of the rail. Motorised traverser carriages must be at the front of the cart.
See Fig. 47

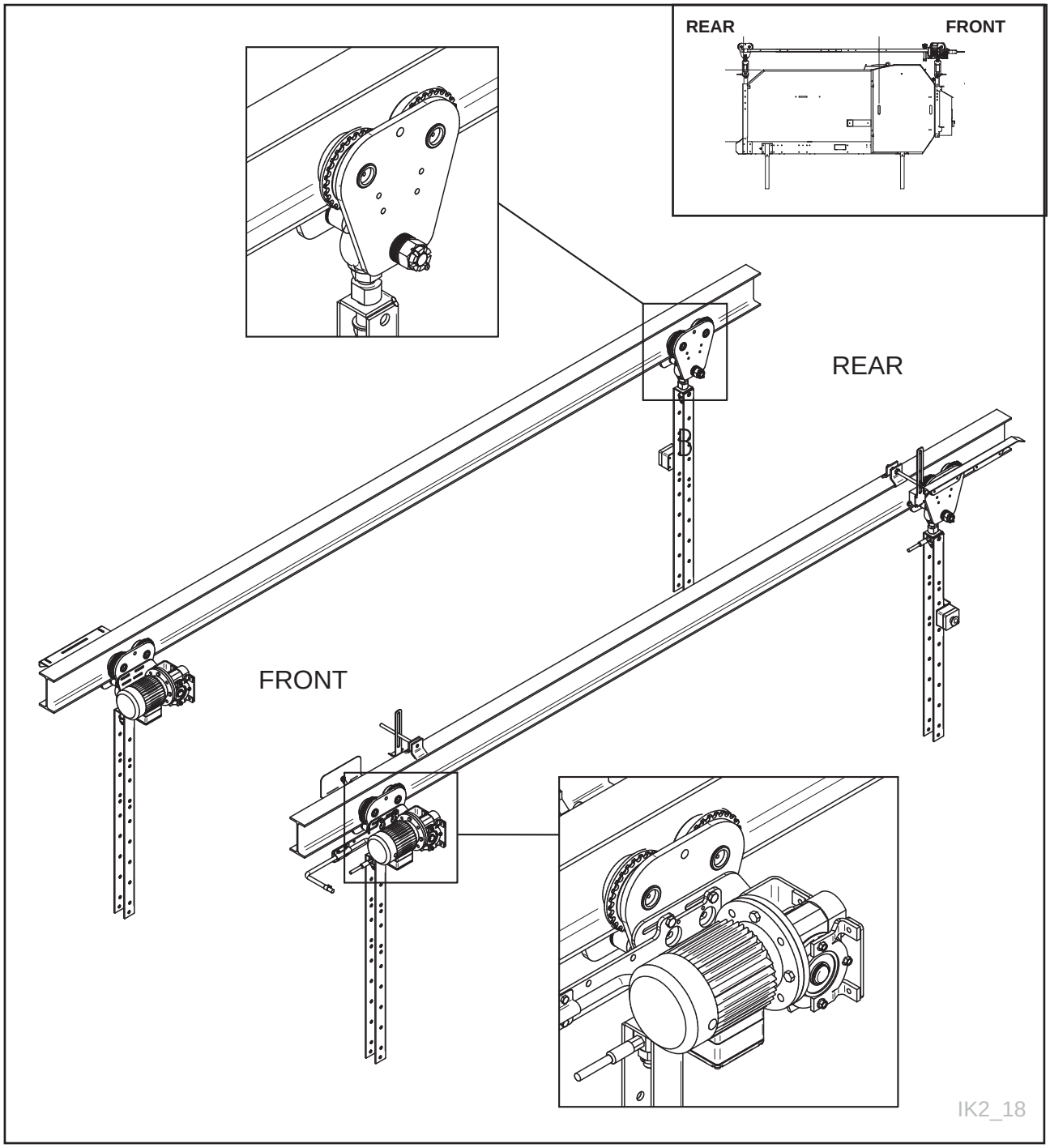


Fig. 47

2.7.1 Installing equipment on traverser carriages

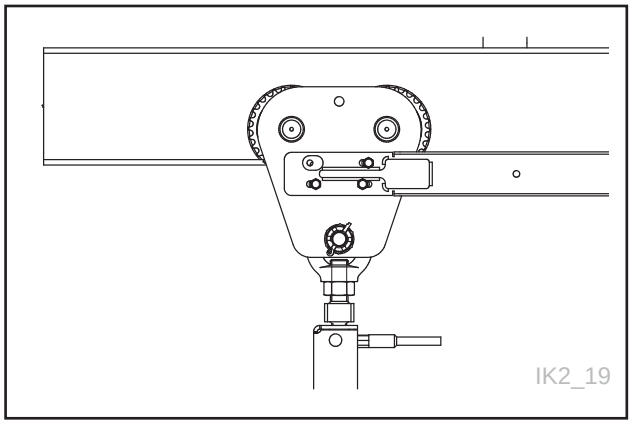


Fig. 48

The back and front traverser carriages are connected with a brace. The bar is first attached to the traverser carriage, then the channels are screwed to the outside of the bar. This only applies to 2-rail systems.
See Fig. 48

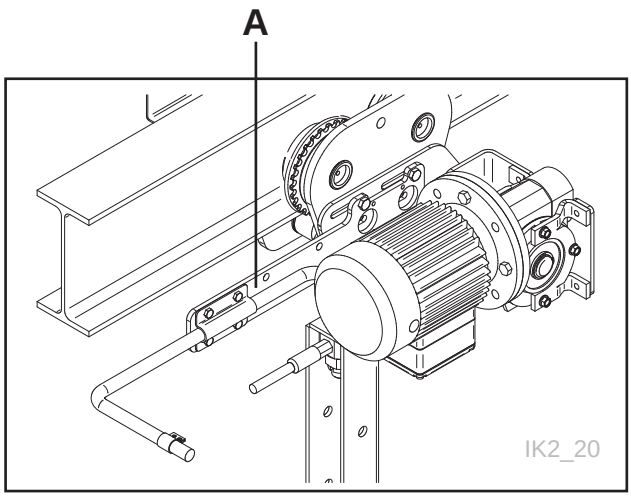


Fig. 49

The clamp for the power transformer is attached. The bar provided is first screwed to the traverser carriage, and then the clamp is inserted into the threaded hole using pliers.
See Fig. 49

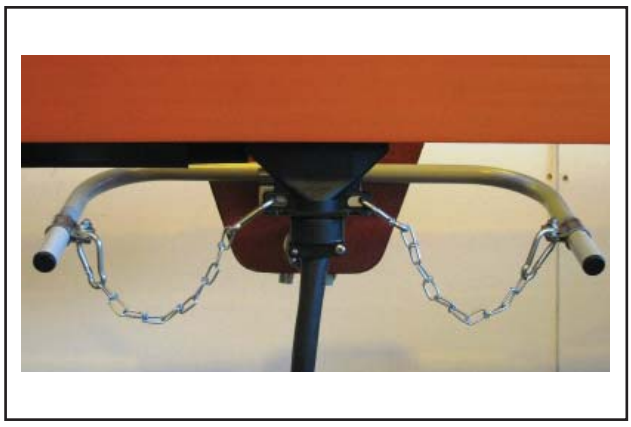


Fig. 50

A chain is attached to each arm to pull the transformer in a horizontal direction. It is important that the c. hain is straight (not bent) and that it hangs slightly downwards
See Fig. 50

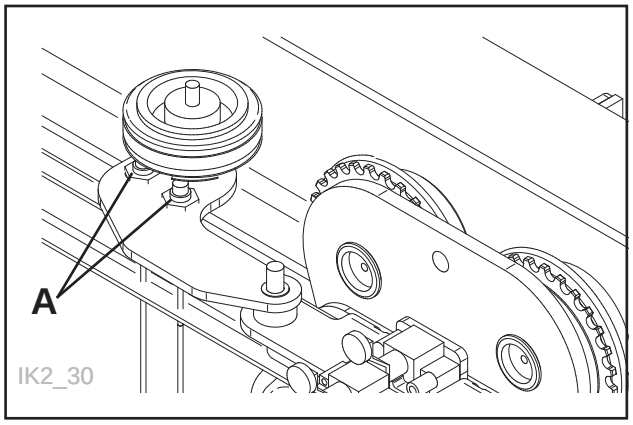


Fig. 51

Screw the counter wheel onto the outside of the traverser carriage (opposite side of motor).
See Fig. 51
Distance between inductive transmitter and pulse star (sensing distance) **A = 1-3mm.**

Make sure that no wires are pinched.

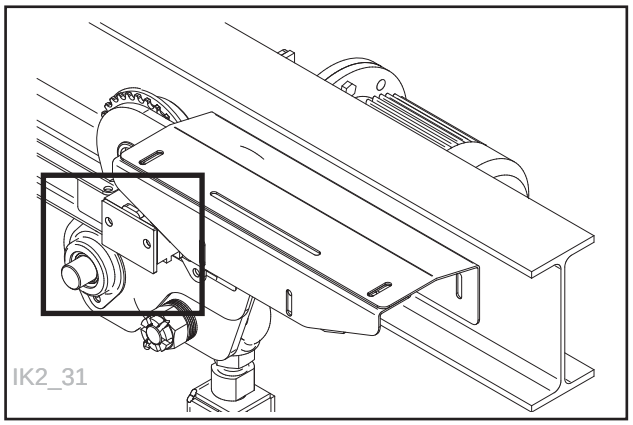


Fig. 52

Screw the transmitter for the external signal onto the traverser carriage. There is a 2-wire conductor on the back of one of the suspension channels.
Connect the conductor to the transmitter.
The transmitter should preferably be screwed onto the back left traverser carriage, on the inside.
See Fig. 52

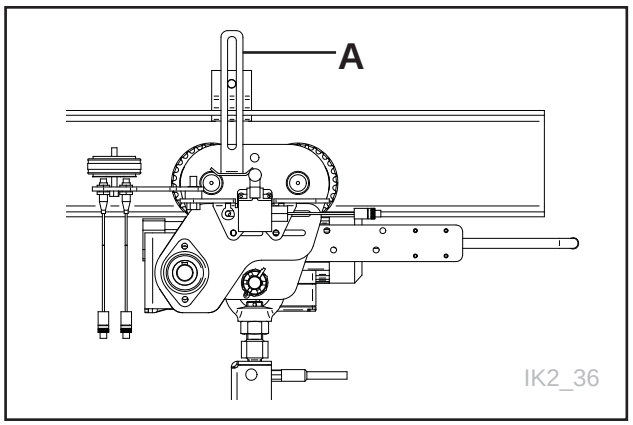


Fig. 53

If the robot is to be supplied by a reservoir, a switch rail must be screwed onto the back of the traverser carriage that mechanically starts the reservoir. This is attached to the 2 topmost holes (shaft or traverser carriage wheel).
See Fig. 53

A = Reset switch impactor

2.7.2 Installation of transmitter bracket with pulse wheel

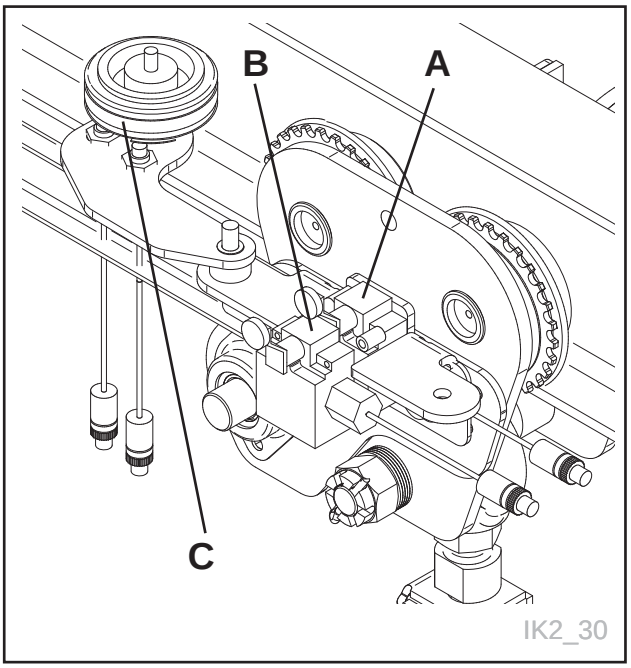


Fig. 54

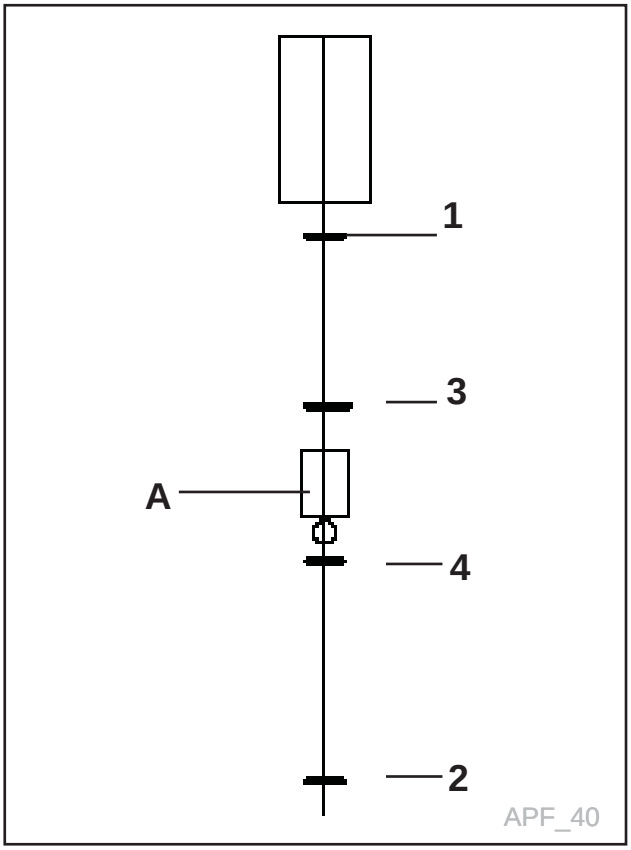


Fig. 55

Mount the reset switch on the traverser carriage. The impactor for the reset should be on the inside of the feeding passage that the robot traverses during
normal operation. This is important for the robot to get into the correct position.
The transmitter bracket (delivered complete) is supplied with M8 bolts directly on the traverser carriage.
See Fig. 54
Check that the pulse wheel and sensor have the correct working distance, i.e. 2-4 mm. The transmitter bracket can be fitted to both sides of the carriage. Hang up the carriage with the pulse wheel and push the carriage toward the reset to verify that impact triggers the switch.

Switch for reset fitted:

- **(A)** reset switch 1 and 2
- **(B)** reset switch 3 and 4
- **(C)** pulse wheel with transmitter

Fitting the reset(s)

The pulse wheel, which is the robot's navigation system, will have a certain margin of error over time. This is why we use 1 or 2 resets to calibrate the position of the robot.
Their placement is important, as the robot must be as precise as possible in critical positions, especially when refilling forage and concentrated feed.

Fit the resets at suitable positions. Adjust them in terms of height and width so that the switch on the robot is properly activated.
The robot control system has a dedicated menu for finding these.

The reset impactor is fitted as follows in the cowshed:
reset impactors 1 and 2 must be mounted at either end of the cowshed.
reset impactors 3 and 4 must be mounted in conjunction with the feed hatch or concentrated feed downpipe. **See Fig. 55**

A = feed hatch/concentrated feed

2.7.3 Mounting of 24V DC receiver

The receiver is screwed into the rail. When concentrated feed release A is over the middle of the opening, transmitter B should be in the middle of the receiver. It is important that it be mounted properly so that the brushes always touch the copper strips. **See Fig. 56**

NB!
It is very important for the receiver to be 100% on target; otherwise it will be destroyed.

Wires from the 24V DC receiver are connected to the concentrated feed screw controller.
For example, this can be a simple controller consisting of a motor protection device and a 24V DC contactor.
This is done by the authorized electrician.

NOTE!
Make sure that the polarity (+24V=brown OV= blue) matches the 24V DC transmitter. Incorrect polarity may cause the components to short circuit.

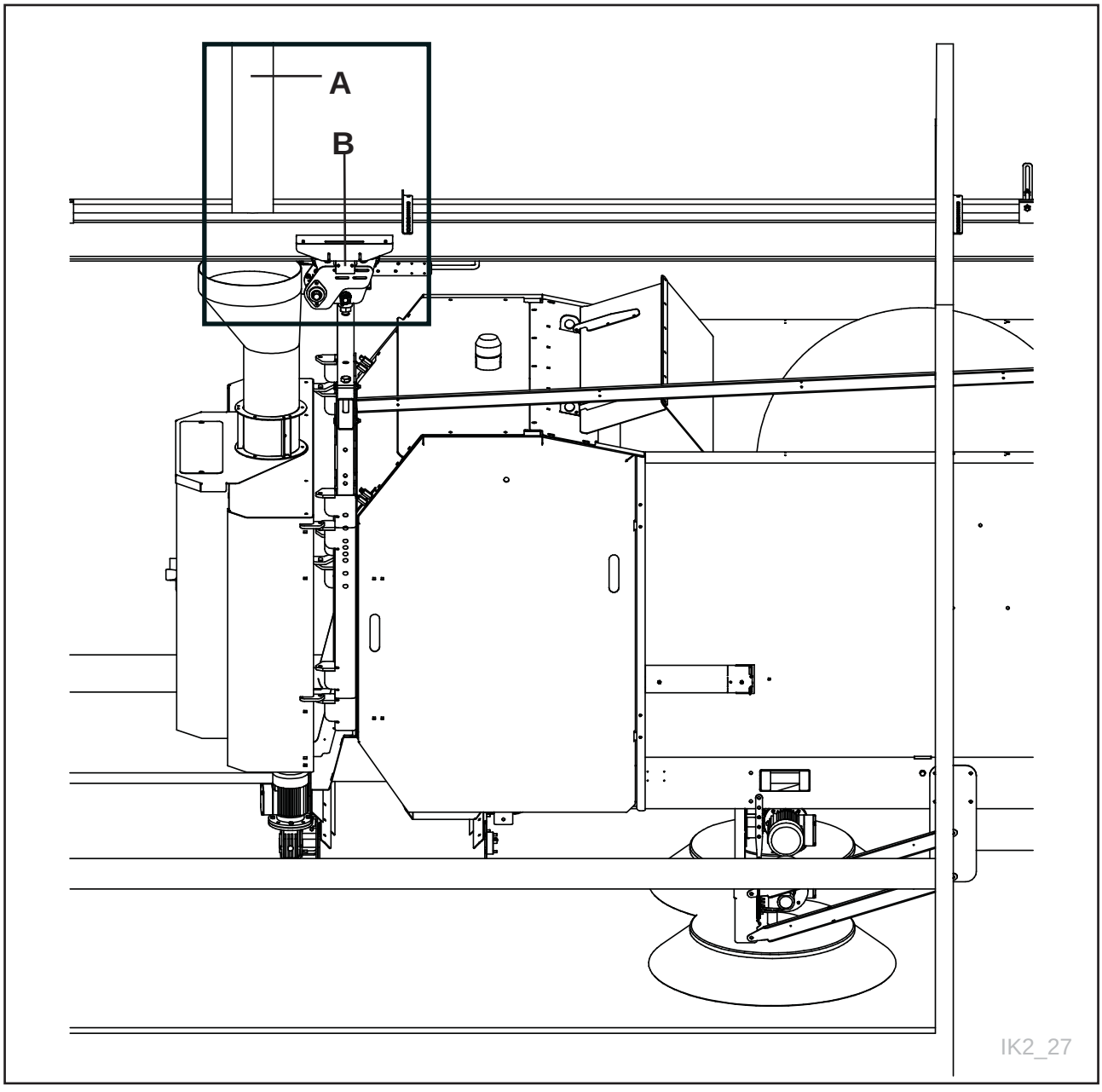


Fig. 56

2.7.4 Installing equipment on traverser carriages on 1-rail

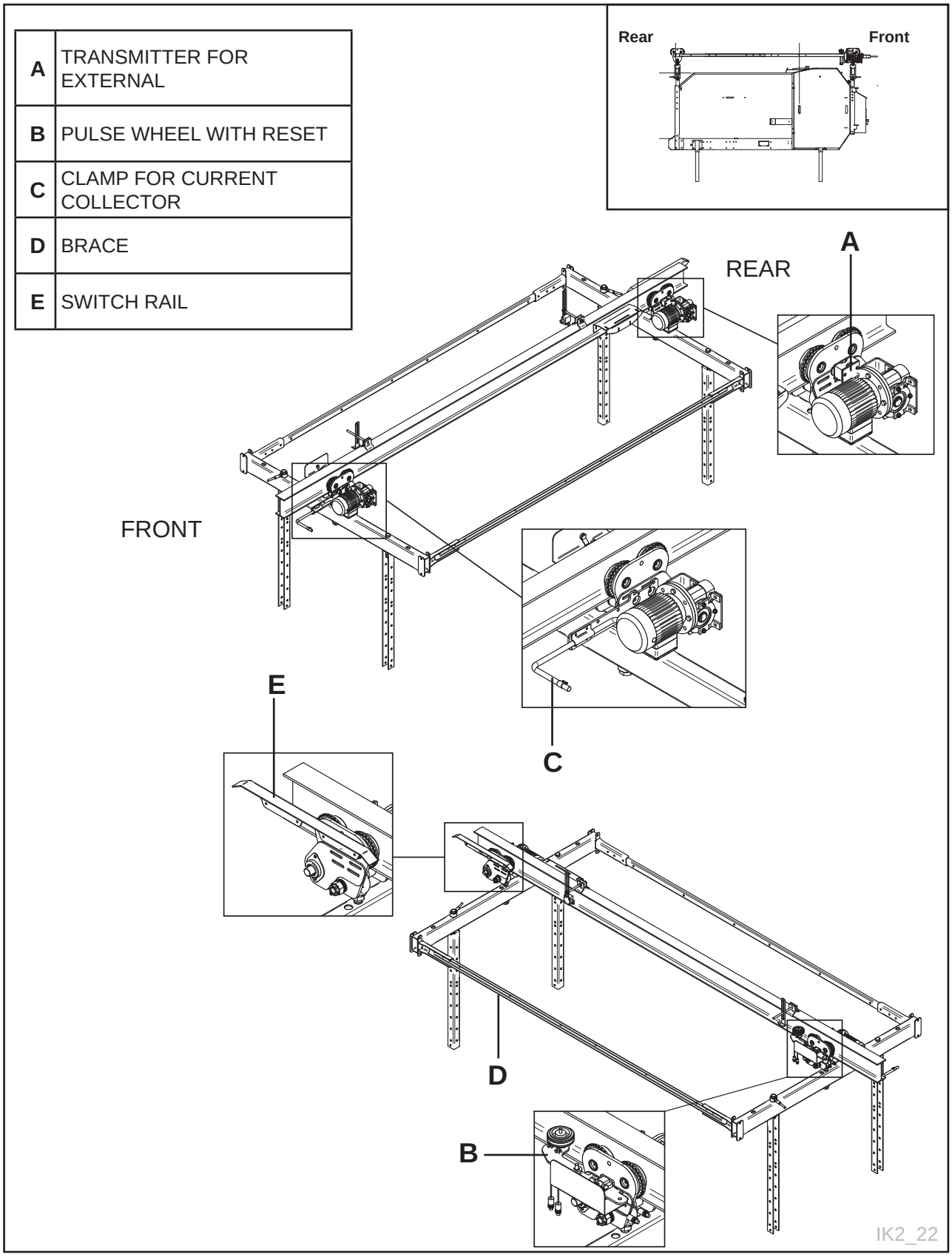


Fig. 57a

2.7.5 Installing equipment on traverser carriages on 2-rails

In order for the robot to be able to function as an automatic device, some equipment needs to be mounted on the robot's traverser carriages. **See Fig. 55**

This is:
Transmitter for external 24V signal (only for robots that refill concentrated feed and water from a source other than a reservoir).
Pulse wheel with reset.
Current collector for power supply through conductor rail.
Switch rail (only if robot is to refill in a reservoir).
Brace connecting forward and rear traverser carriage (single rail only).

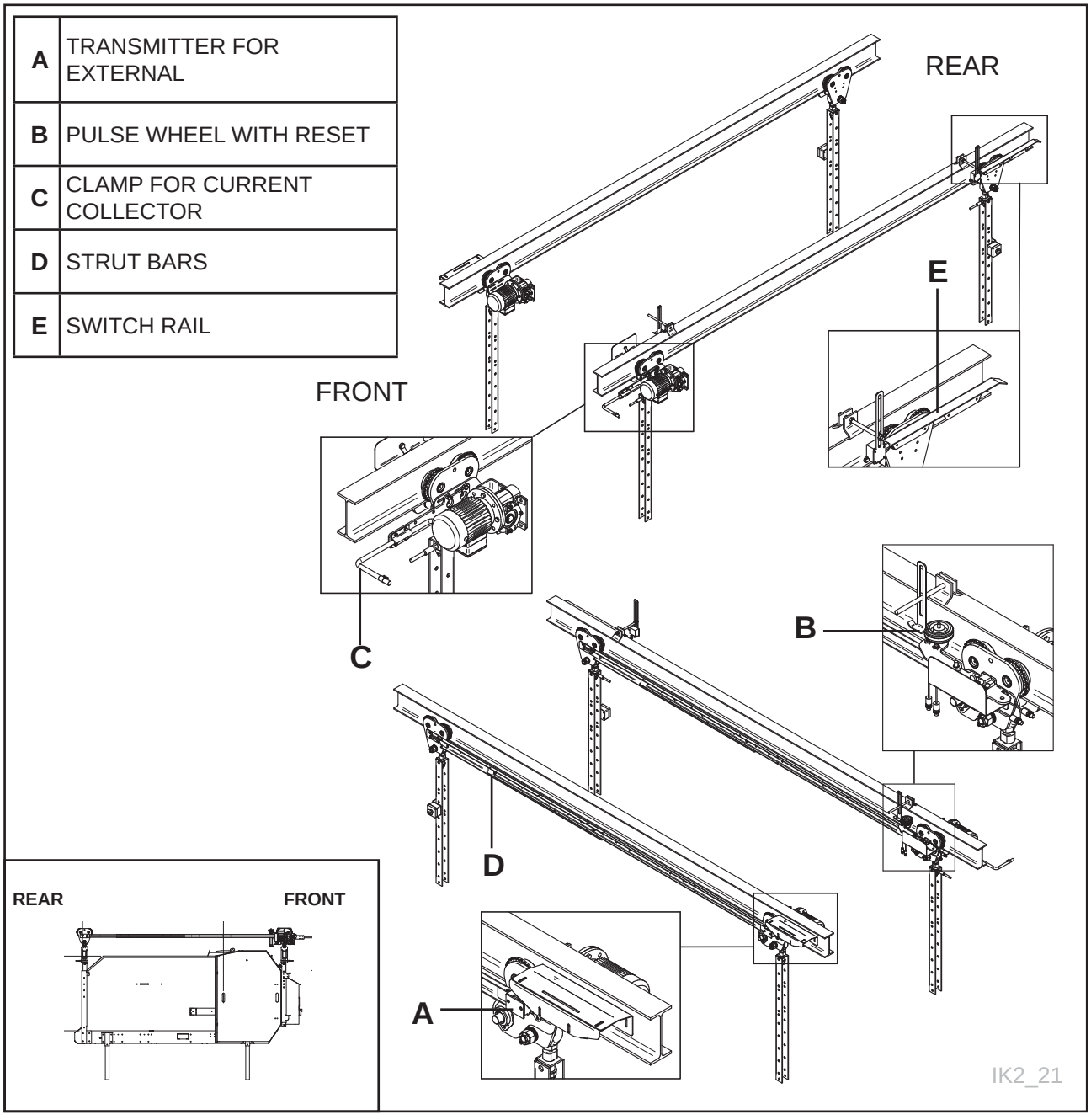


Fig. 57b

2.7.6 Attaching the cart

Before suspending the cart from the traverser carriages, it is a good idea to adjust the ceiling rails to the correct height, to avoid having to use a jack to adjust this later.
See Fig. 58

Critical factors with regard to the installation height are:
The longitudinal rail – or if applicable the buffer at the rear if the machine (1rail) – must be a sufficient height when the cart collects a new round bale from a reservoir.
The machine's side dispenser must be at a sufficient height to prevent it getting stuck in the forage and forage movement.

Measurements for double rail
Height from the base (sidewall) and up to the upper edge of the rail channel.
This is an absolute minimum measurement. See Fig. 58

A = recommended measure 350mm
B = recommended measure 500mm
C = minimum measurement 1650 mm, applies to a round bale diameter of 1250 mm.
This measurement increases for larger round bale diameters.

Less risk of sealing between cross conveyor and machine.

Double rail

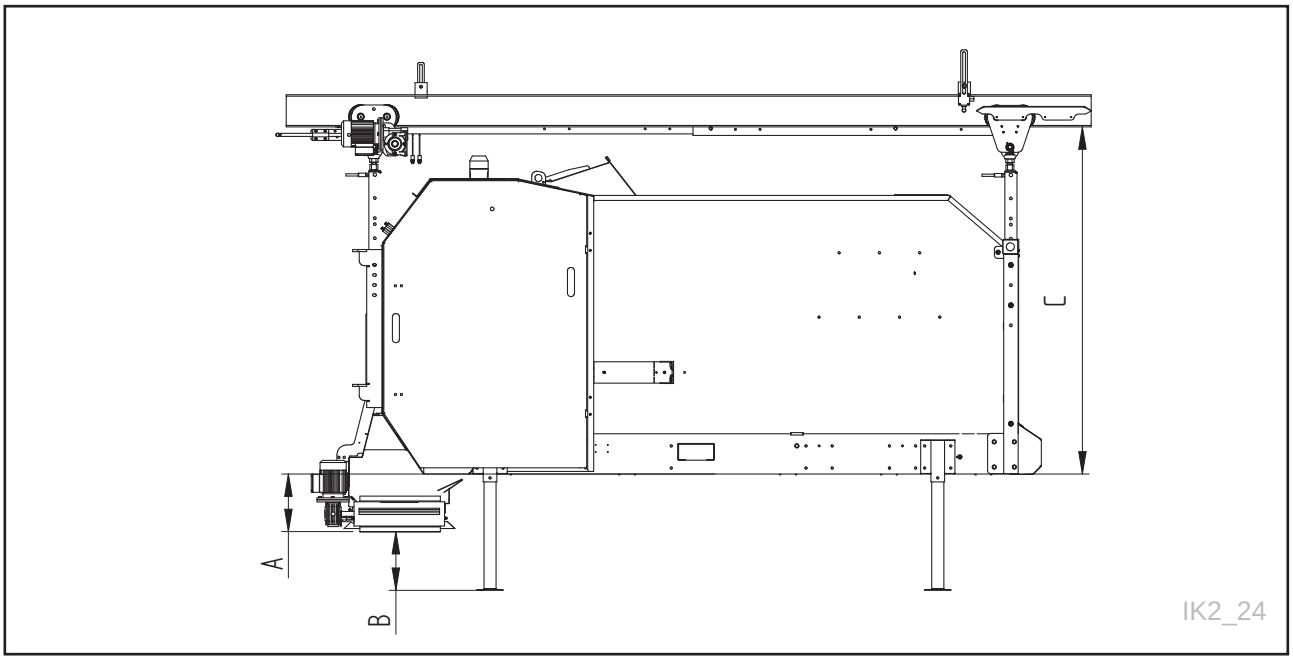


Fig. 58

Measurements for single rail

Height from the base (sidewall) and up to the upper edge of the rail channel.
This is an absolute minimum measurement.
See Fig. 59

A = recommended measure 350mm
B = recommended measure 500mm
L = minimum measurement 1650 mm, applies to a round bale diameter of 1250 mm.
This measurement increases for larger round bale diameters.

Height adjustment of side dispenser
We recommend the greatest possible height between the bottom of the machine and the side dispenser.
Less risk to the weather stripping between side dispenser and machine.

Single Rail

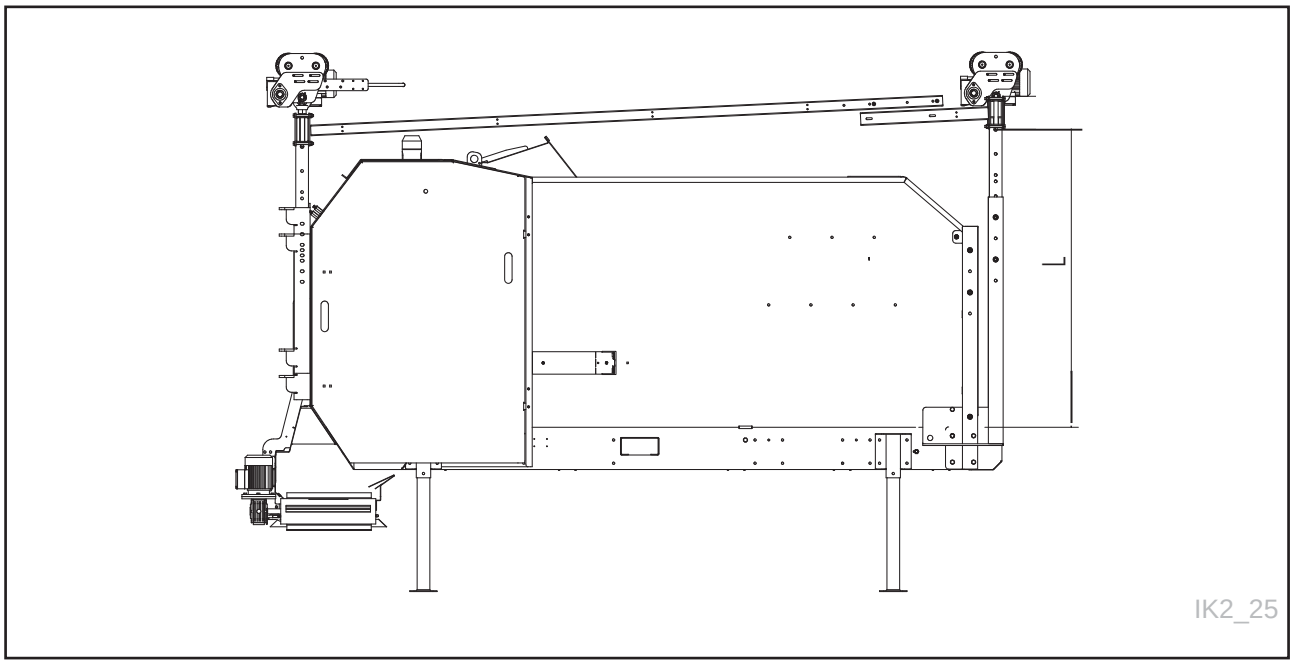


Fig. 59

2.7.7 Installing the safety chain

- The robot is screwed in place with bolt A in eye nut **B**
- **NB!** There needs to be clearance between locknut **C** and pipe **E**
- Tighten locknut **C** to eye nut **B**
- To finish, secure the bolt using pin **D**

The cart should be screwed in place in both front and back with bolts in the eye nuts.
Fit the chain through the pulley axle and boom.**See Fig. 60**

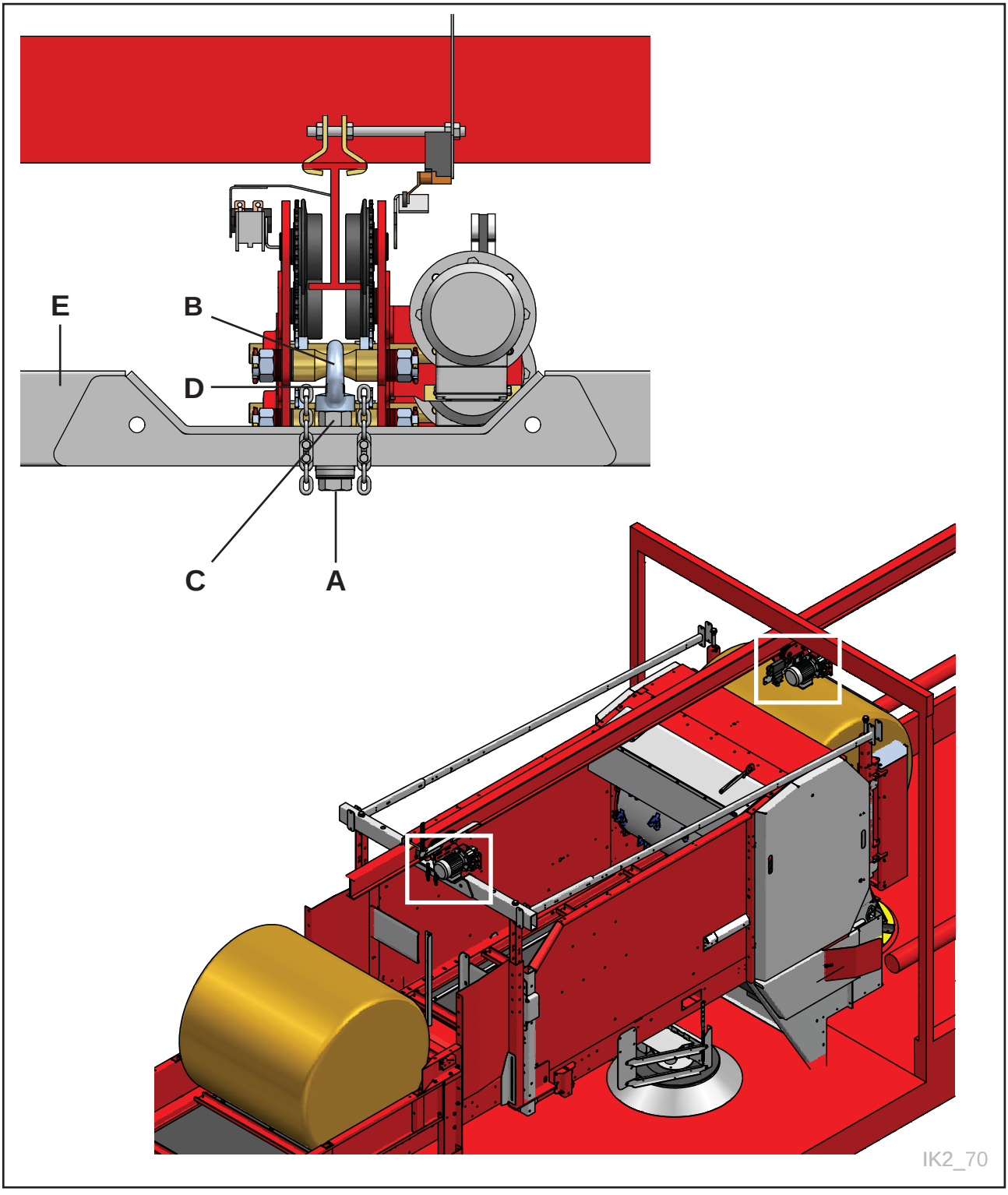


Fig. 60

2.8 Installing the reservoir

The reservoir for 2 or 3 bales must be attached to the end of the rail behind the cart where it is to be filled.
When the cart is to be filled, the conveyor belt in the reservoir should enter the box in the cart so that the machines overlap one another. This is to avoid spillage and to ensure the safest possible filling process.
It is also important that the reservoir is in the right position with regard to the K2 FeedRobot in its width direction, so that the cart slides easily into the reservoir.

All communication between the K2 FeedRobot and the mixer cart is mechanical, and consists of the K2 FeedRobot activating a "carriage end" switch in the rail.

The reservoir must be height adjusted to ensure reservoir conveyor and K2 CombiCutter conveyor will not collide. A distance of 350mm between underside of reservoir and underside of K2 CombiCutter is sufficient. **See Fig. 70**

NOTE! Make sure that the magazine and any concentrated feed filling have the same position
These 2 positions must be separated by at least L = 500mm.

A=
- Minimum 2600 1-rail
- Minimum 2400 2-rails
- Minimum 2300 without cross conveyor 1-rail
- Minimum 2100 without cross conveyor 2-rails

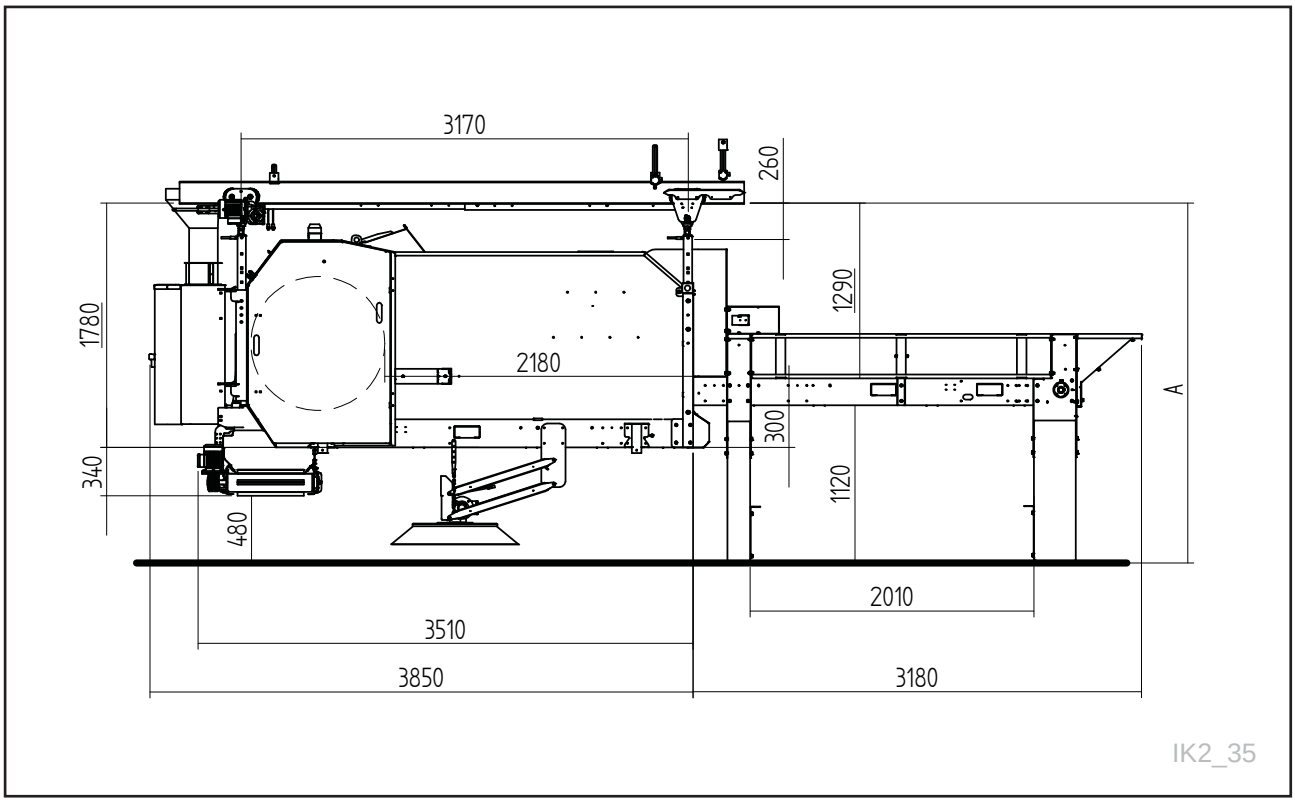


Fig. 70

The reservoir must be at a height that ensures that the carrier on the reservoir and the carrier on the K2 CombiCutter do not collide. The height of the reservoir is adjusted by loosening the screws and lowering the feet. Use a hydraulic jack or forklift truck to lift the reservoir.
See Fig. 71

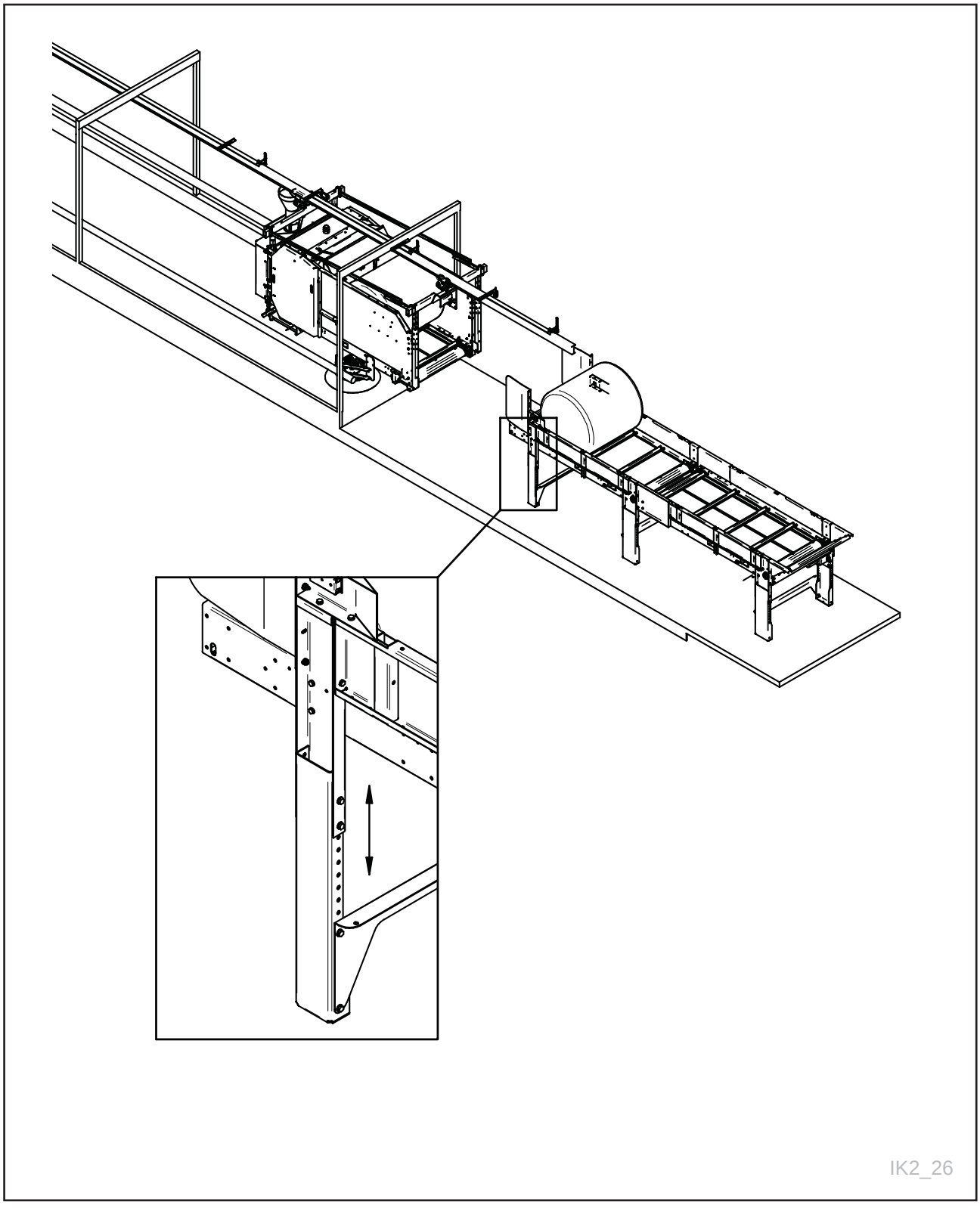


Fig. 71

The carriage end switch is screwed into the rail. Its position must be such that when the K2 FeedRobot is right next to the reservoir (rear edge of frame touches front edge of leg); the switch must almost touch the switch rail on the traverser carriage.**See Fig. 72**

If the cart is pushed away during filling, the switch will come off the rail and power is cut.

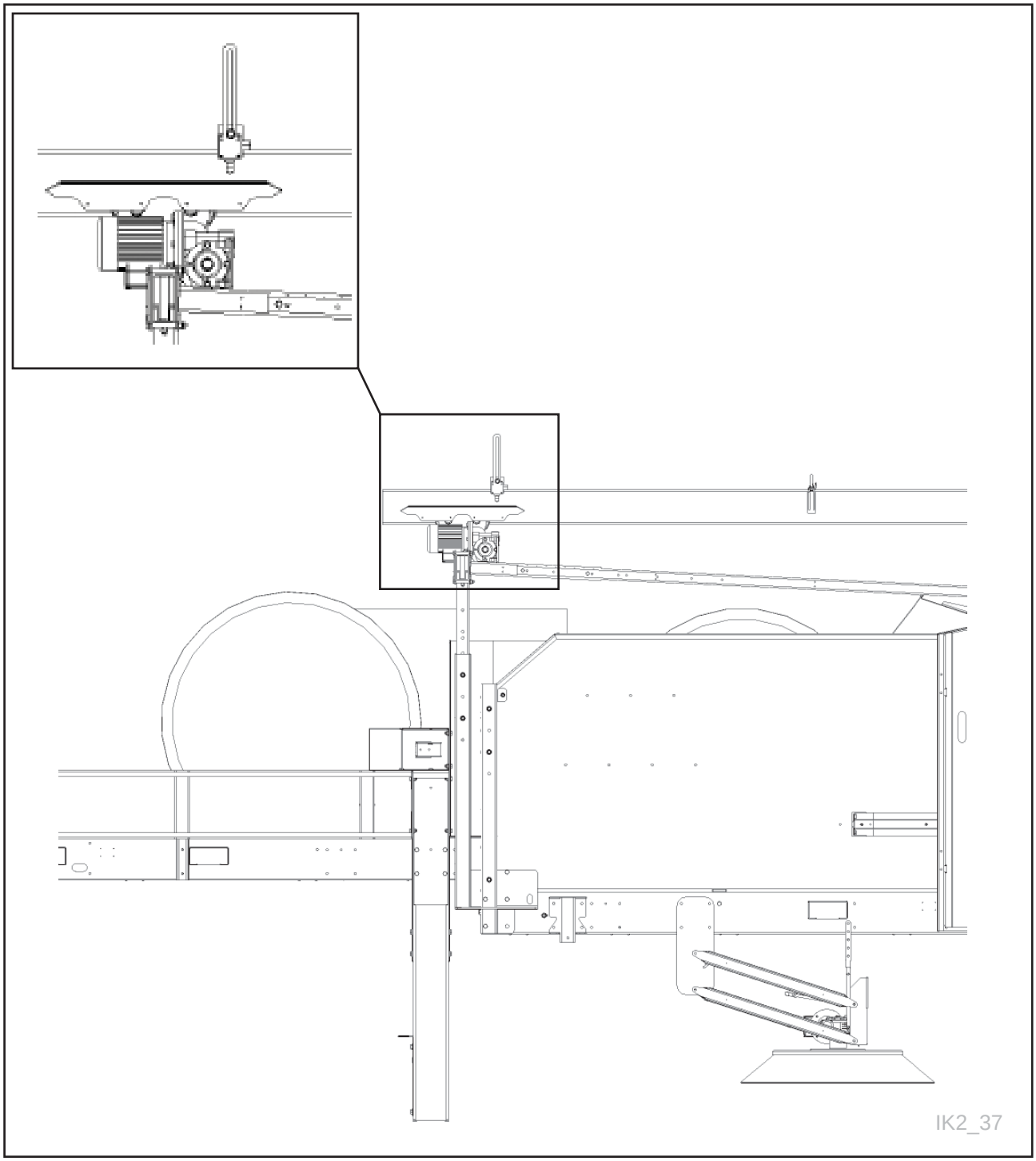
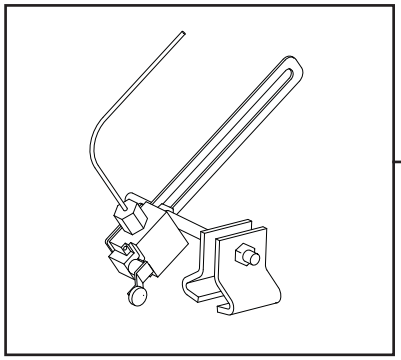


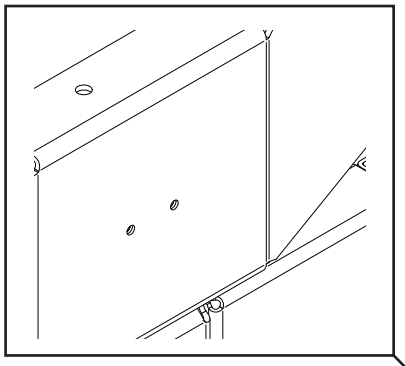
Fig. 72

2.8.1 Connecting the sensors/switch

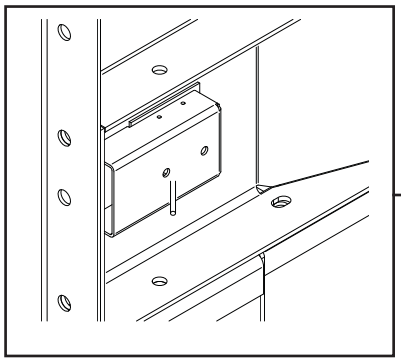
Switch in rail



Fotocell transmitter



Fotocell receiver



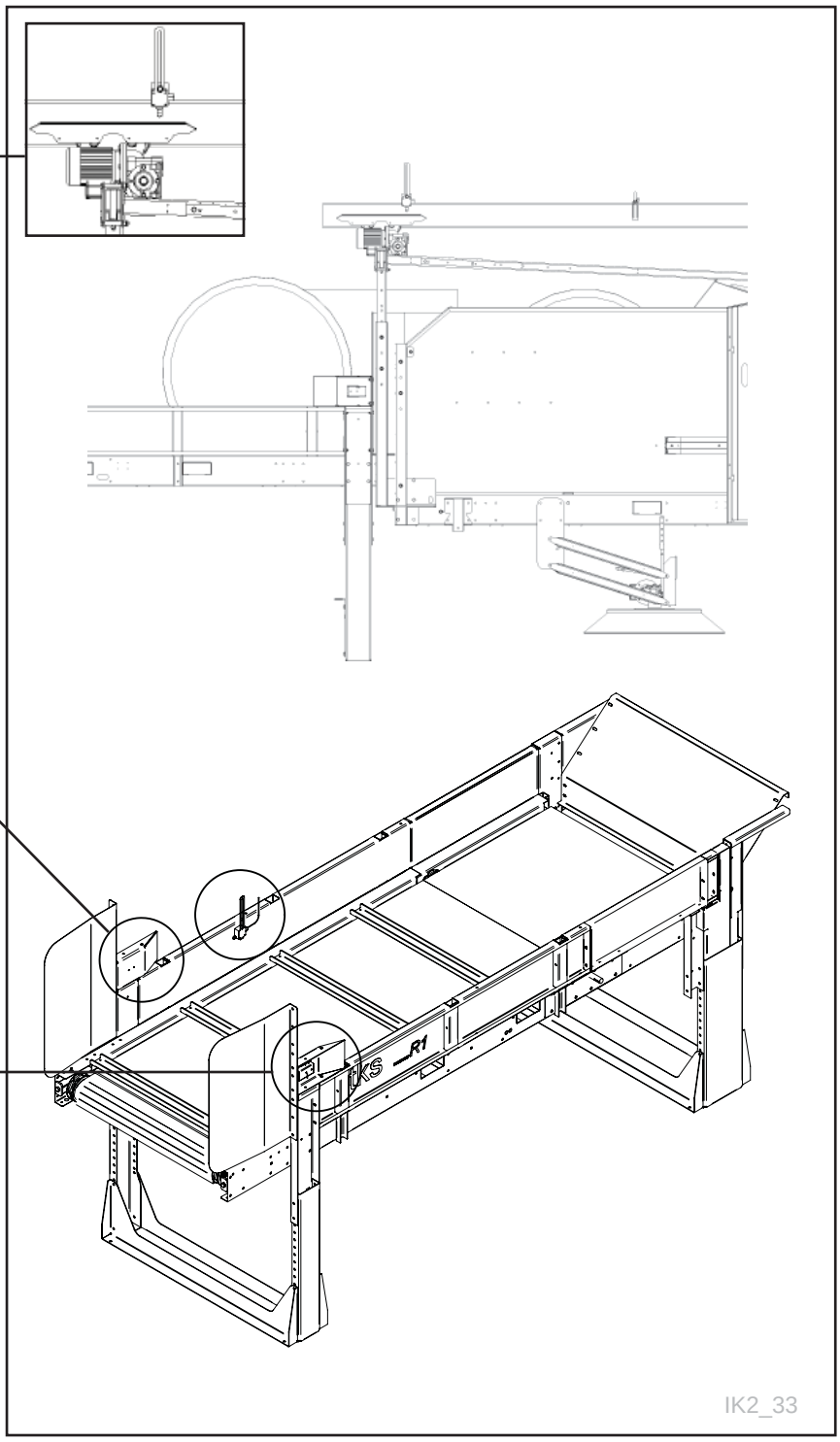
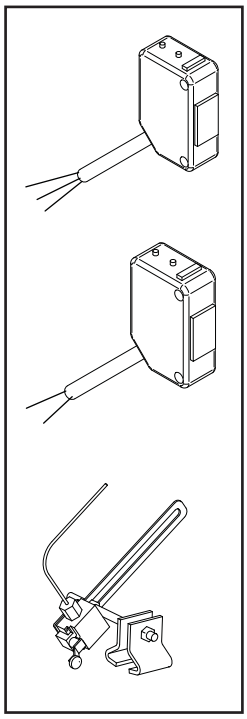


Fig. 73



Fotocell receiver (3 wires)	Cable	Colour	Terminal block
	24V	Brown	7
	0V	Blue	8
	Signal	Black	9
Fotocell transmitter (3 wires)	**Cable**	**Colour**	**Terminal block**
	24V	Brown	5
	0V	Blue	6
Fotocell transmitter (3 wires)	**Cable**	**Colour**	**Terminal block**
	24V	-	1
	0V	-	2

Fig. 74

The cabinet for the reservoir is given a suitable position on the wall. It is a good idea for there to be easy access to this cabinet when refilling the reservoir.
In order for the reservoir to work together with the robot, photocells and a carriage end switch must be connected to the cabinet. **See Fig. 73**

Connections in the panel
The table shows where the individual cables for the individual sensors are to be connected to the terminal block.It is important that the cables are properly installed (e.g. in plastic tubing or under metal casing) to avoid damage.

The connection of the electricity supply to the panel and electricity to the motor must be carried out by an authorised electrician.
.

Test
Does the reservoir work correctly?

- First try turning the forward/back button on the panel on the wall. For example, use a handle and push the cart up to the switch. The belt should now move forwards.
- Press the step button on the panel. The belt should now move forwards.
- Place your hand in front of the photocell. The belt should stop after a few seconds.

2.8.2 FeedBrush

- Adjust the spring on the brush so that it presses lightly against surface A
- Adjust using brace B
- Clean once a week. Remove feed residues from the motor, gear, and axles.

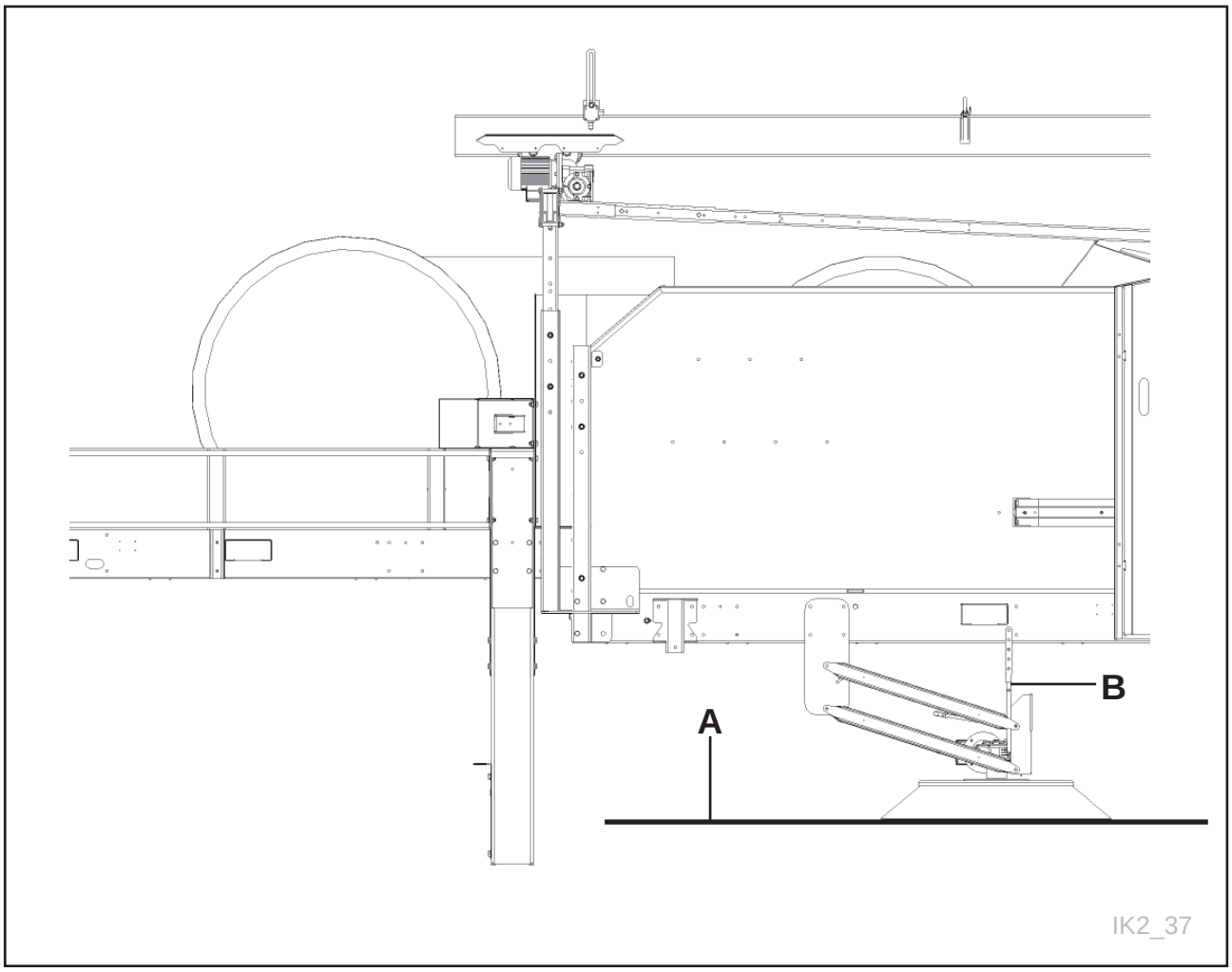


Fig. 75

2.9 Installation of FeedHopper

All communication between the K2 FeedRobot and the mixer cart is mechanical, and consists of the K2 FeedRobot activating a "carriage end" switch in the rail.

Recommended installation dimensions for FeedHopper **Fig. 76**
For further details, see the Feed Hopper instruction manual.

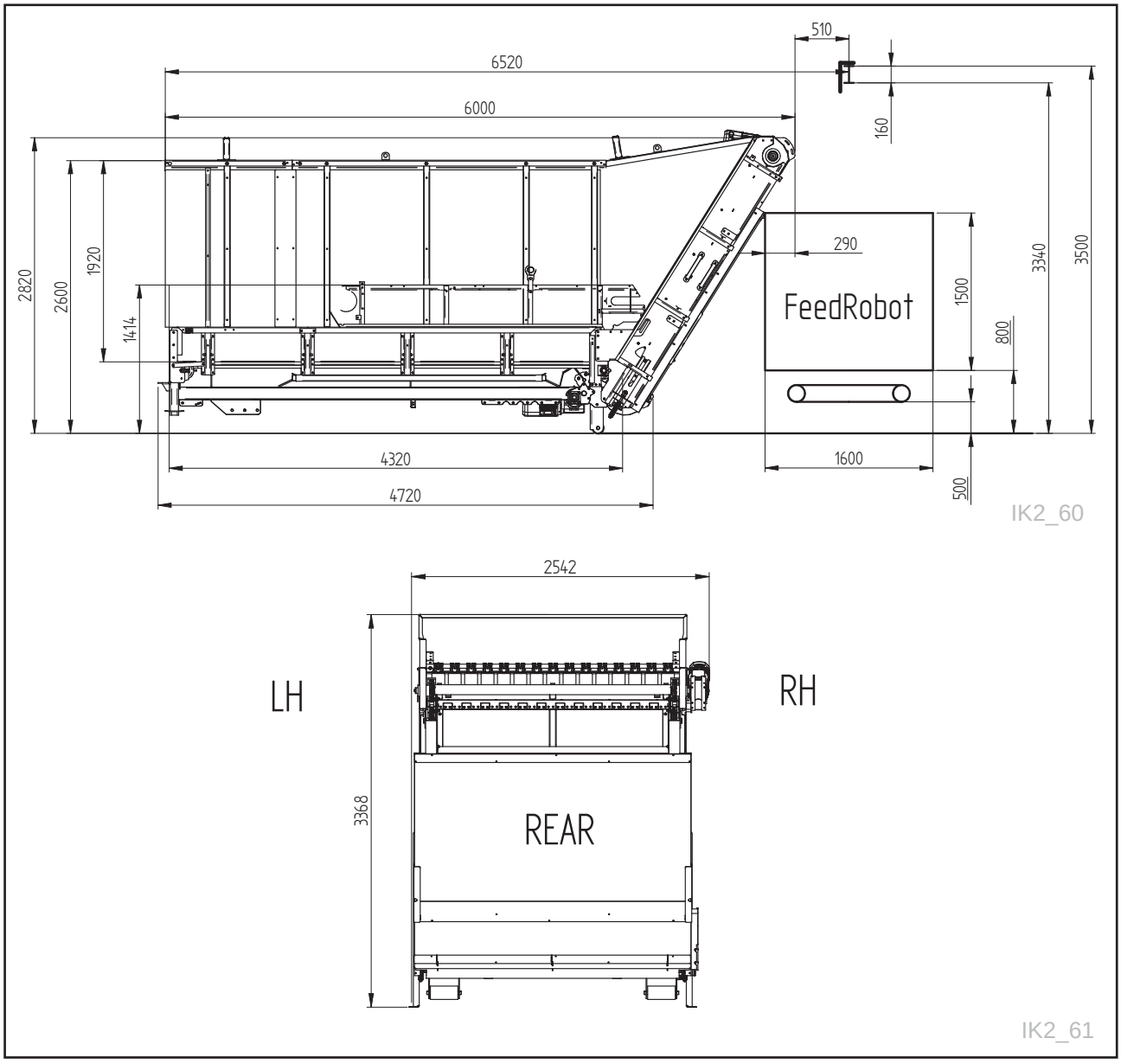


Fig. 76

2.10 Installation of FeedMixer

All communication between the K2 FeedRobot and the mixer cart takes place either via the carriage end switch or via a radio transmitter/receiver.

Recommended installation dimensions for feed hopper **See Fig. 77**
For further details, see FeedMixer instruction manual.

FeedMIX 17m³

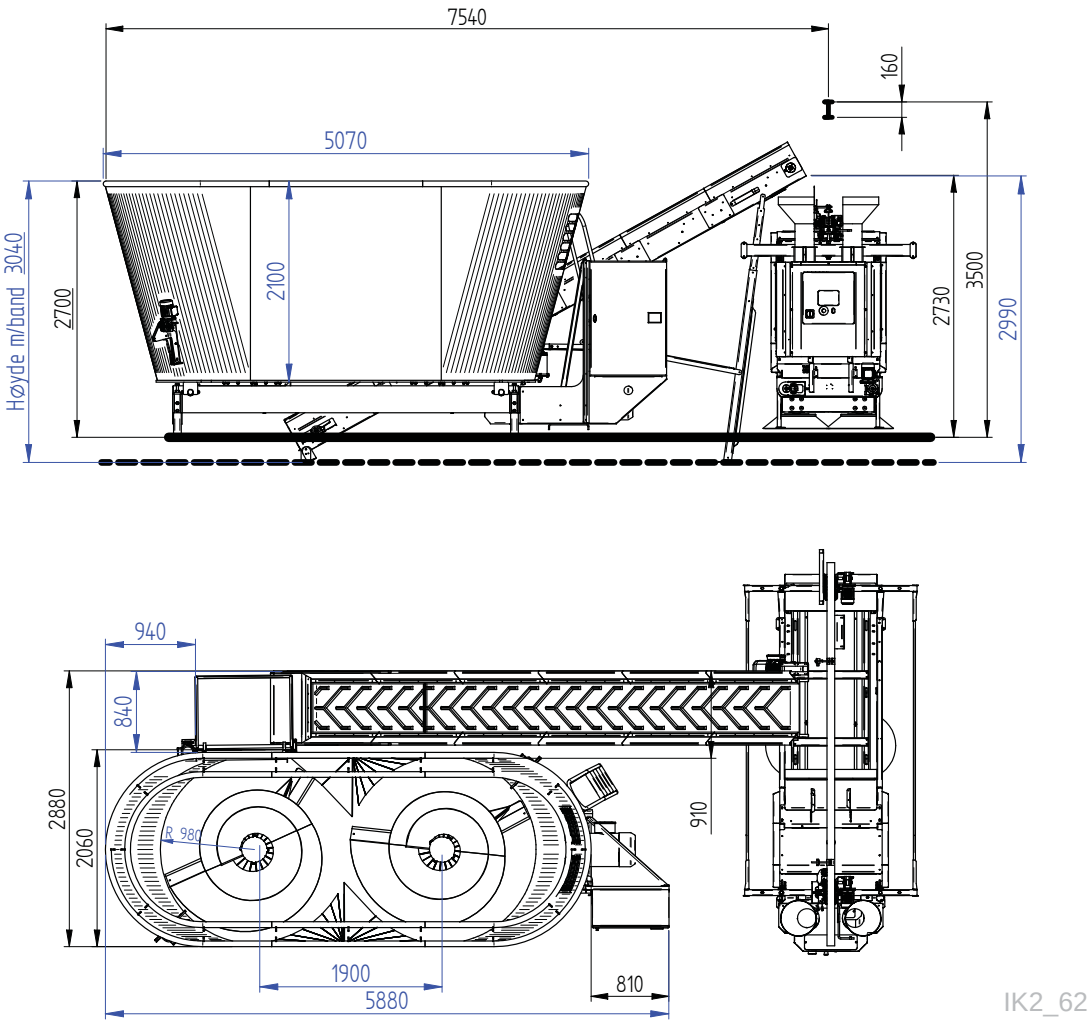


Fig. 77

Measurement

Type		Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix	Feed-Mix
Volume m³		**6,5**	**8**	**10**	**12**	**14**	**17**	**20**	**24**	**27**	**30**	**36**	**40**
Lenght		3600	3800	4200	4600	4750	5800	6400	6600	6800	6800	9100	9100
Width		2150	2150	2150	2460	2560	2150	2460	2460	2560	2560	2460	2460
Height with tr. belt crosswise		2390	2530	2830	2870	2950	2740	2440	2830	3130	3280	2900	3050
Height with tr. belt lengthwise		2690	2830	3130	3170	3250	3040	2740	3130	3430	3580	3200	3350

2.11 Checklist before starting the K2 FeedRobot

Before starting the FeedRobot, it makes sense to go through this checklist to uncover any faults.

1. Manual motor operation
In order to check that the motors are rotating in the right direction, start the following motors in the robot's manual operation menu.

Shredder generator
The drum should rotate clockwise when you are standing to the right of the robot. In other words, the drum should be dragging the feed up toward the counter knife cassette. Switch phases if the drum is rotating in the wrong direction.

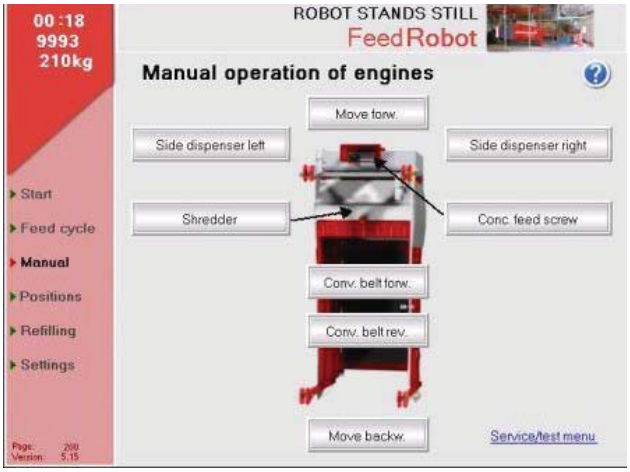
Side dispenser
Side dispenser right, i.e., when you are standing with your back to the display, the belt should be on your right. Vice-versa facing the left side.

Roof operation
Use the roof operation forward and roof operation reverse buttons. When you press roof operation forward, the robot should move toward you when you are facing the display.

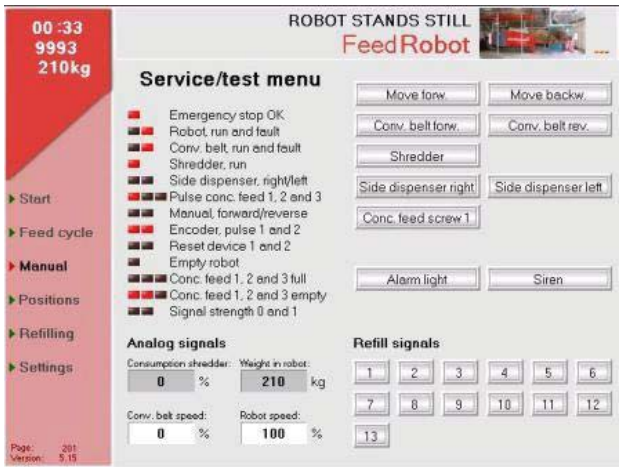
Conveyor belt
Press the button, then verify that the feed screw turns and supplies feed.

Tip:
You can use a stylus like those used for PDAs/smartphones to make it easier to write on the screen. Do NOT use sharp objects that could damage the screen.

Concentrated feed screw
Press the button, then verify that the feed screw turns and supplies feed.



Side 200



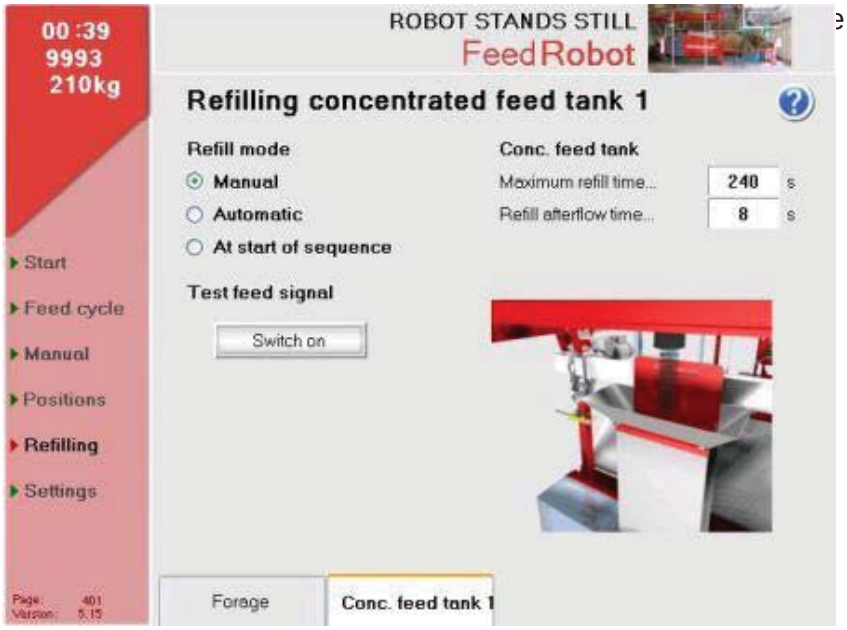
Side 201

2. Check the direction of the pulse wheel
When you manually move the robot forward (toward you when you are looking at the display), the position on the display should be positive. In other words, if the reading on the robot is 5005 and you move the robot forward, it should count off 5006-5007-5008, etc.

3. Check for obstructions on the rail.
Move the robot manually along the rail and check to make sure that there are no obstruc tions preventing normal operation of the robot.

4. Check that the robot enters and starts the Reservoir
Move the robot manually into the reservoir and make sure that it starts as it should.

5. Check that the robot is able to start the external concentrated feed screw
Move the robot to where it is to refill with concentrated feed. If you and the electrician have e out when you press this button.



Side 401

Now the robot should be ready to start. In the event of other complications, please contact your dealer or TKS.

3 User manual

3.1 Programming

- Decide how many feeding zones you need and how many times you wish to dispense feed.
- TKS recommends one feeding zone for milk cows and one zone for each pen.
- This makes things simple and easy to keep track of.

Start times:
Milk cows: minimum ten times a day.
Calves and dry cows: minimum twice a day.
Bulls: minimum four times a day.

3.2 Group feeding in cowshed

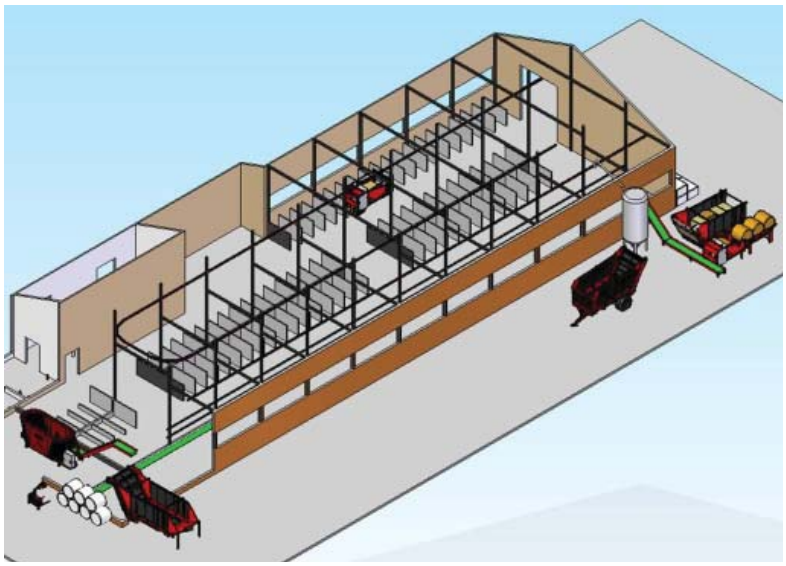
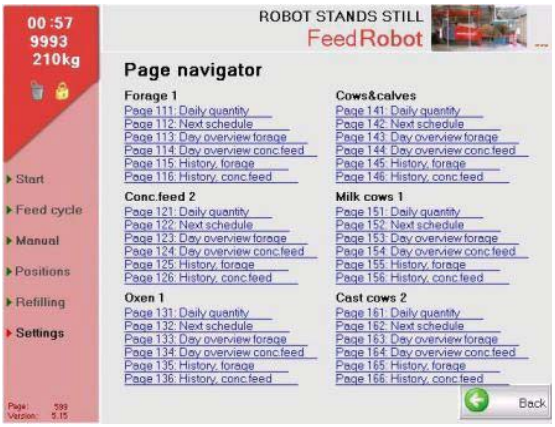


Fig. 78

3.3 Page navigation

Side 599



Side 599

If you tap the page number on the bottom left-hand side of the display, you will enter this overview screen.
From here you can enter the individual screens by tapping the page you want to see.
Here you will find all the pages in the display programs.

Side 1

Main menu

This image is displayed when the robot is not in use.
Launch the programme by touching the fields on the left (A) kommer du inn i programmet.
At the bottom (B), you can select the desired panel to start a feeding session outside the programmed schedule. (e.g. pure forage).
The quantity dispensed will not be included in the total quantity

Side 515

Choose language

We recommend running the Set-up Guide when programming the system for the first time.
Go to the Settings menu, select Activation and then Setup Guide – (Code: capital A).
A panel will appear on the screen when you return to the start page.
Follow the instructions until programming is complete.

Side 500

Settings and information

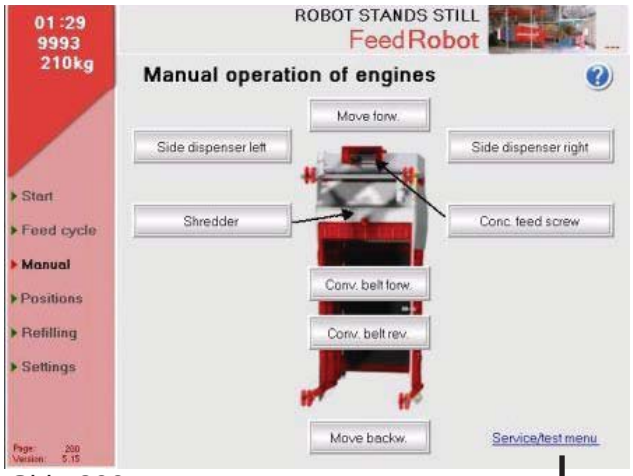
Select the appropriate icon to make settings adjustments and
to adjust various parameters.

Help function
Press the question mark (A) in the top right-hand corner of the screen to see an explanation of the page.
Press the cross to return.

Side 513

Factory settings

NOTE! You must always retrieve the factory settings on initial startup (or if you need to restore the original settings).
Press "Retrieve" factory settings.
NB! It is also possible to delete all information using this function
.

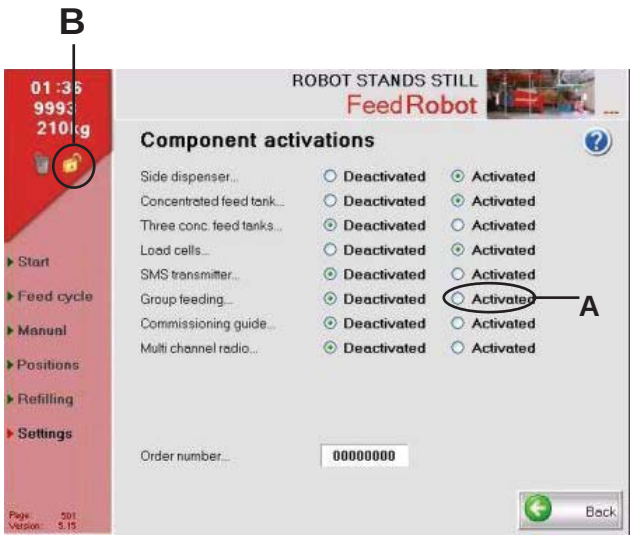


Side 200

Side 201

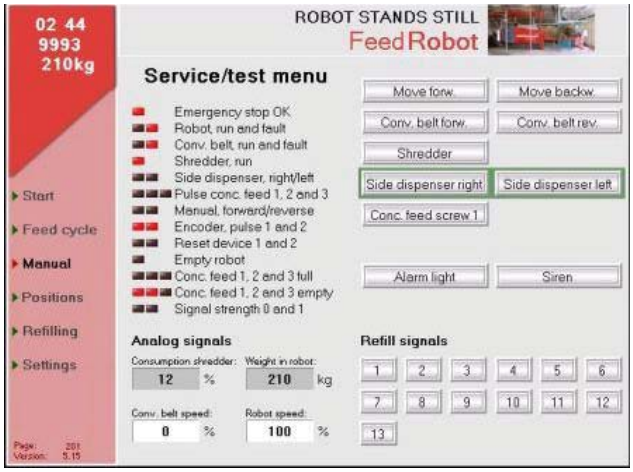
Manual motor operation

To launch component activation, do the following:
Select Settings and then padlock **(B).**
Code capital "A" and press Enter.
Activate the components fitted on the machine.
TKS recommends using the Setup Guide when using a new machine for the first time in order to store all the information. Manual view should always be deactivated.



Side 501

Press the question mark in the top right hand corner to see an explanation of the current page.
Press the cross to return



Side 201

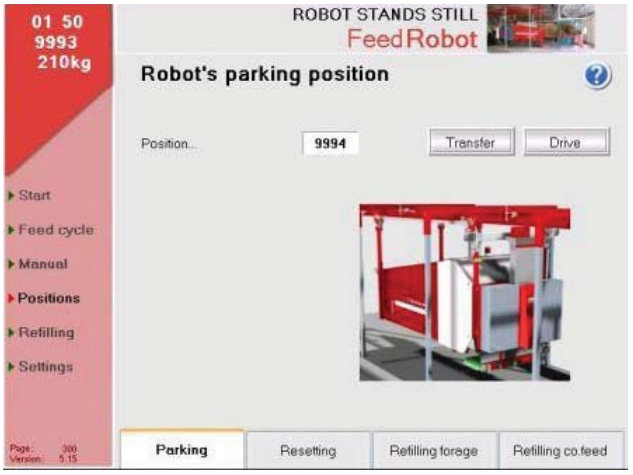
Service/test menu

This can be found at the bottom of the Manual motor operation page.
You can test all functions here

Side 504

Date and time

Enter the date and time.
Remember to save your setting by clicking the button.
Use "Simulate change of day" if you have run the robot for a few test rounds; this will delete the amount dispensed during the course of this day.

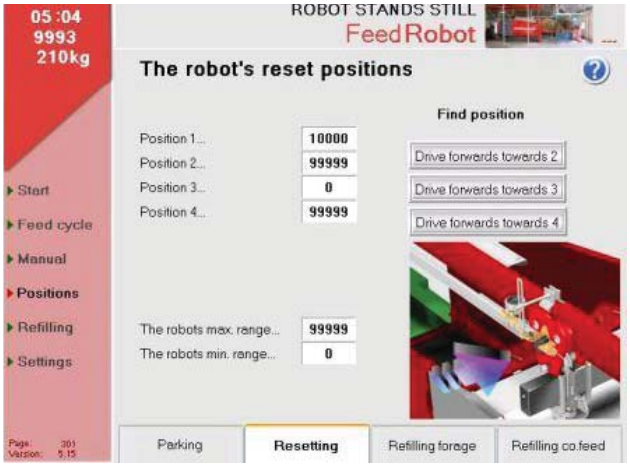


Side 300

Robot's parking position

Move the robot using manual switch (**A)** to the desired parking position.
Then click Transfer to save the parking position.

A



Side 301

The robot's reset positions

- Before programming can take place, an impactor for the reset switch (on the counter wheel, traverser carriage) must be fitted to the rail.
- Reset position 1 is automatically set to 10000 when the robot moves past it.
- Move the robot manually to reset position 2 (not past position 2, as this will set this position to 10000 as well)
- Activate the field and key in the positions.
- Repeat this operation on positions 3 and 4

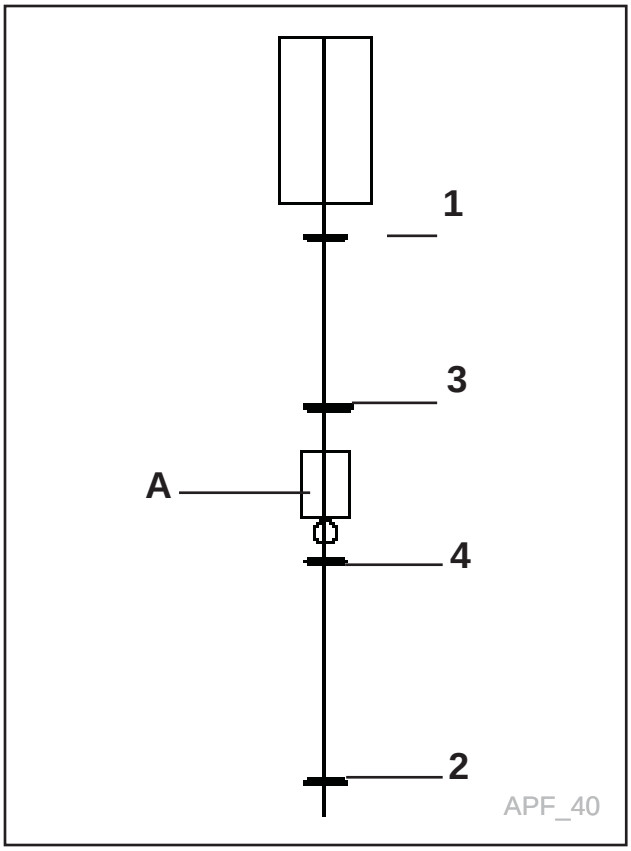


Fig. 79

Fitting the reset(s)

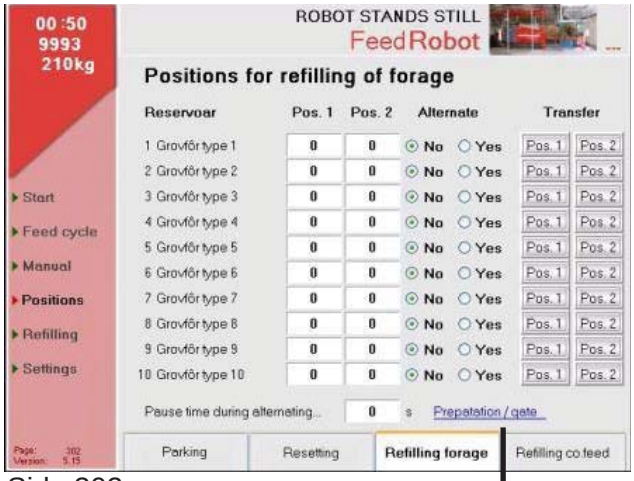
The pulse wheel, which is the robot's navigation system, will have a certain margin of error over time. This is why we use 1 or 2 resets to calibrate the position of the robot.
Their placement is important, as the robot must be as precise as possible in critical positions, especially when refilling forage and concentrated feed.

Fit the resets at suitable positions. Adjust them in terms of height and width so that the switch on the robot is properly activated.
The robot control system has a dedicated menu for finding these.

The reset impactor is fitted as follows in the cowshed:

- reset impactors **1** and **2** must be mounted at either end of the cowshed.
- reset impactors **3** and **4** must be mounted
- in conjunction with the feed hatch or
- concentrated feed
- downpipe. **See Fig. 79**

A = feed hatch/concentrated



Side 302

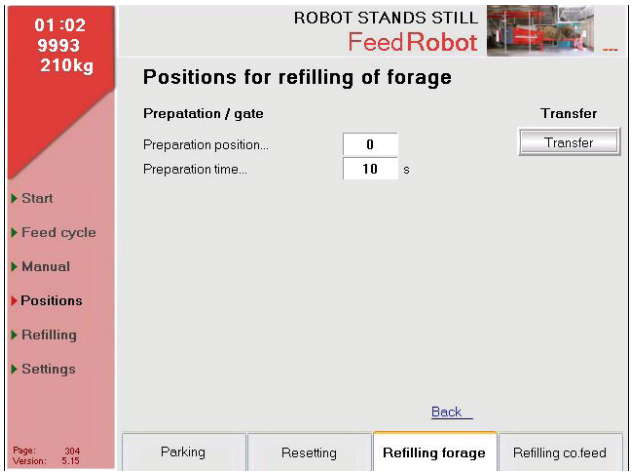
Side 304

Positions for refilling with forage

Group feeding:

If you have a group feeding and use multiple types of forage, these need to be entered here. If the robot is to be filled in alternation, the start **(Pos.1)** and stop **(Pos.2)** must be entered; after that, select yes for alternation.

Adjustable standby position for gate opening when the robot is to exit the gate to refill.



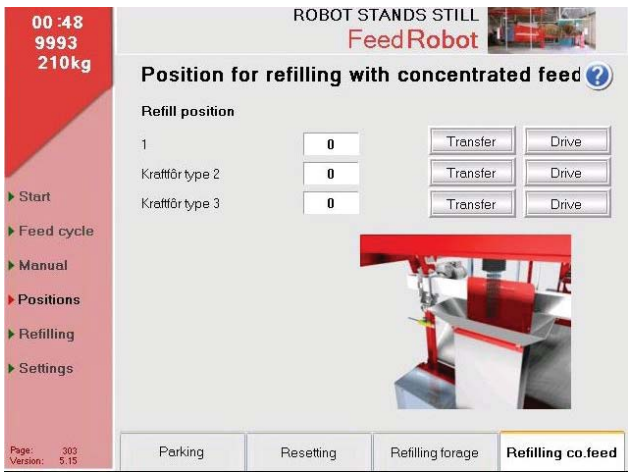
Side 304

Positions for refilling with forage

Valid for refilling with forage in group feeding with multiple forage types.

Preparation time:

The time the gate needs to open.

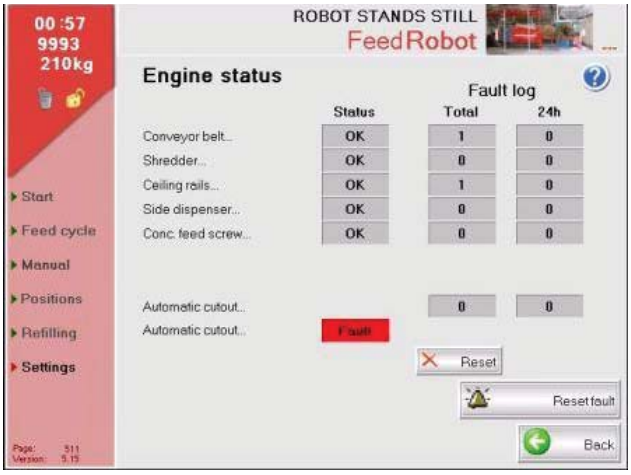


Side 303

Positions for refilling with concentrated feed

Move the robot using the manual switch to the refill position, then click Transfer.

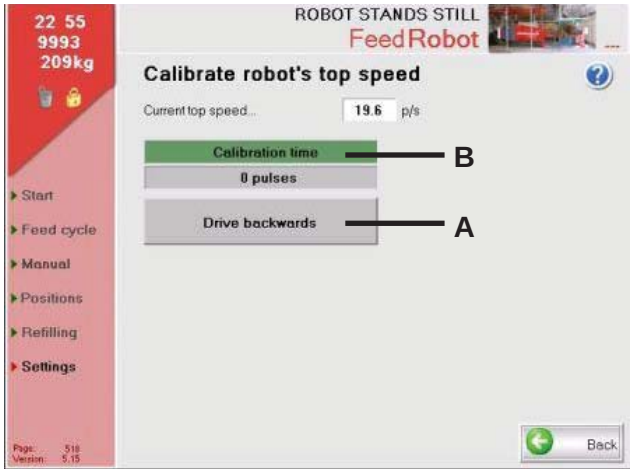
If there are multiple concentrated feed types, the various positions must be entered here.



Side 511

Motor status

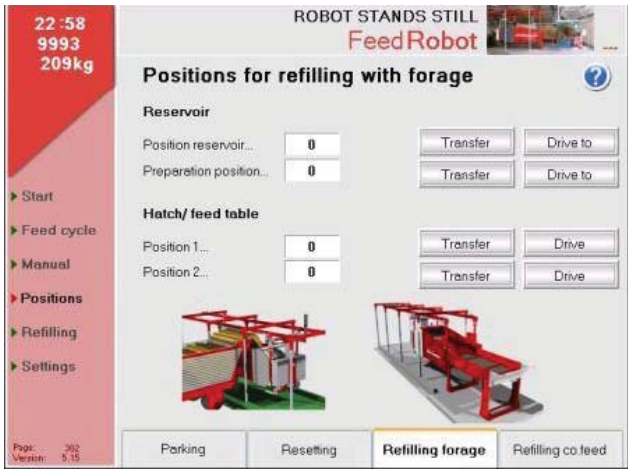
If the motor cuts out, go to this page and reset the shutdown.
If motors or functionality cuts out, clear the cause and reset.
(see separate section on troubleshooting)



Side 518

Calibrate the top speed of the robot

- Advance the robot approximately 20 m into the cowshed.
- Hold button (**A**) until zone (**B**) is full;
- the robot will then reverse in order to obtain an accurate speed during operation..

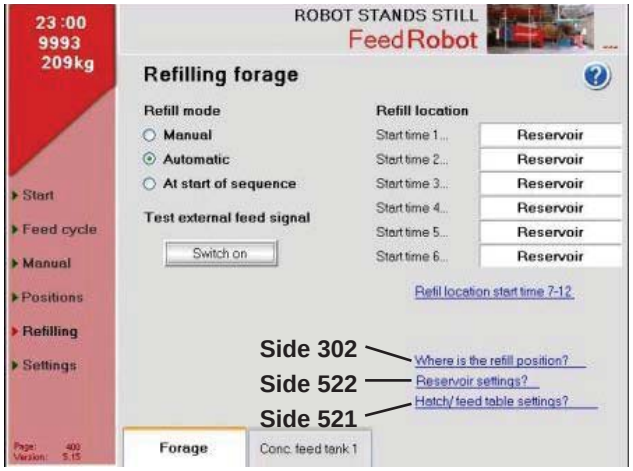


Side 302

Positions for refilling with forage

When the filling position has been set, move the robot to the desired position and click Transfer.
When refilling from the reservoir, the preparatory position should be at least 1 metre from the reservoir position.
This reduces the risk of crushing during refilling
Test: Moves into test position.

Refilling of forage



Side 400

Manual:

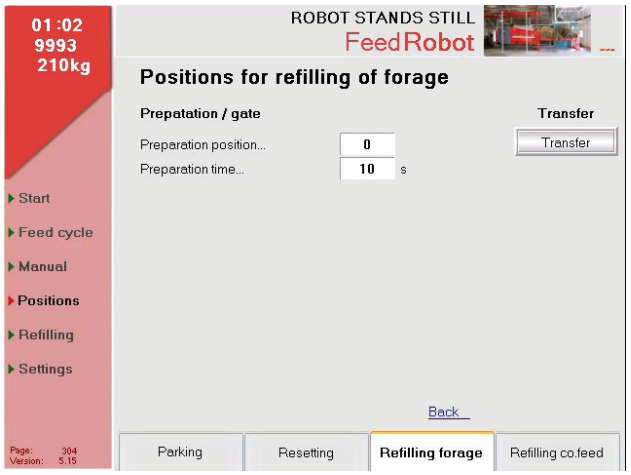
The photocells are not active, manual refilling is required.

Automatic:

The photocells are active, and the robot itself will detect when it has been emptied of forage/concentrated feed.
The robot will then move into the refilling position.

At start of sequence:

The photocells are not active.
The robot will then move into the refilling position every time the robot initiates a feeding session.

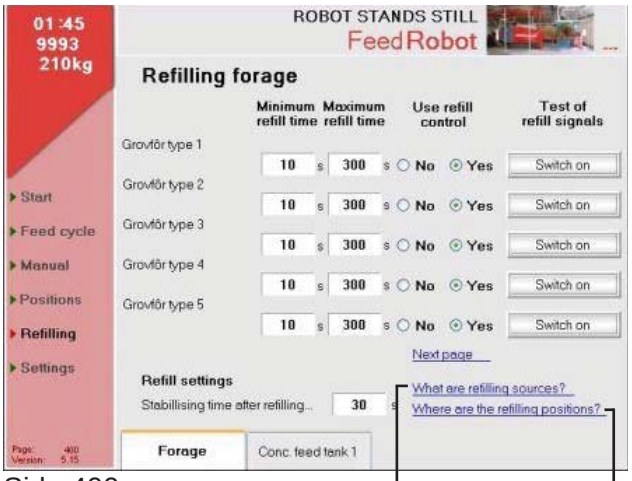


Side 304

Positions for refilling with forage

Move the robot using the manual switch to the refill position, then click Transfer.

If there are multiple refilling stations, the various positions must be entered here.



Side 400

Side 520 Side 302

Refilling of forage

For group feeding:

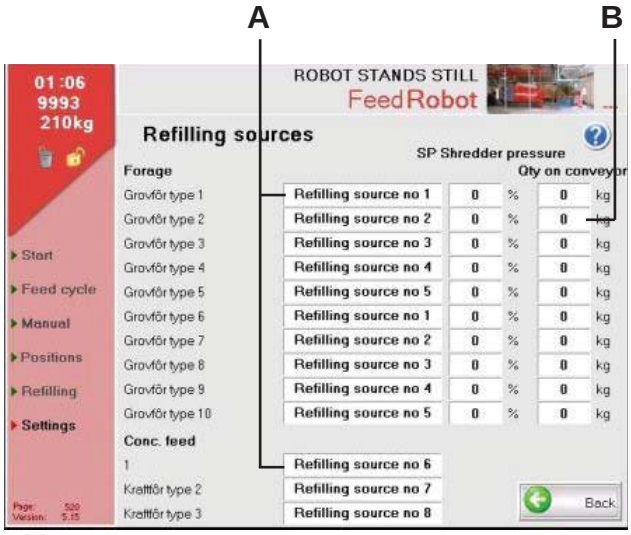
A radio signal starts the refilling process.

Test signal:

- Press the button that says "switch on" and a green frame will appear around the button.
- The signal has to be on then.
- Enter the maximum filling time and stabilisation time after filling.
- When testing the filling signal, you can test a signal on the radio.

(Only for group feeding)

"Use filling control": if filling sources are empty a warning will display on the screen indicating that the filling sources have not attained the desired weight.



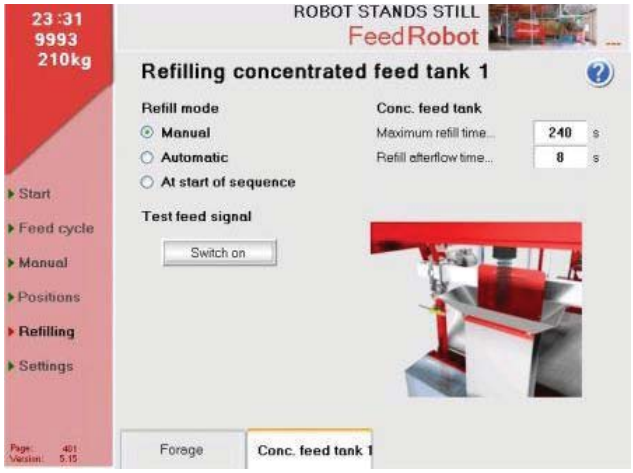
Side 520

Filling sources

- **(A)** Enter forage/concentrated feed type.
- **(B)** Volume remaining on transport belt after weight is achieved.

Volume on belt

Enter the number of kilograms on the transport belt; this weight will then be deducted from the filling volume in order to attain a correct filling weight.



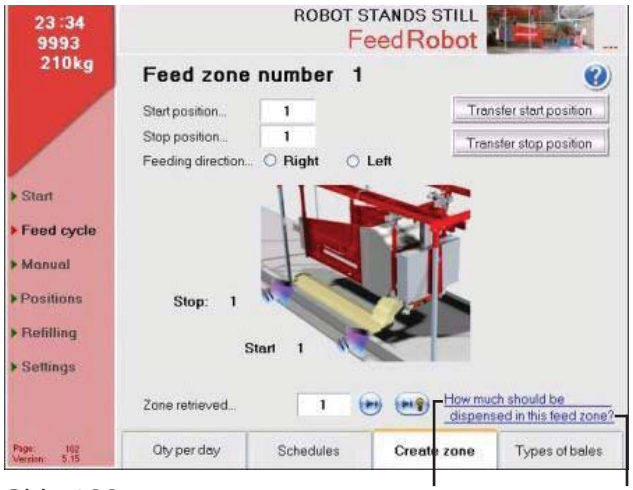
Side 401

Refilling of concentrated feed

Select manual refilling if the cart is to be refilled manually, at the start of a sequence (for each feeding session) or automatically. When the forage tank is empty it transmits a 24V DC signal when it reaches the refilling position. The 24V DC can also be tested by pressing the switch.

The maximum filling time is a safety time that switches off the signal if the sensor in the tank is not activated.

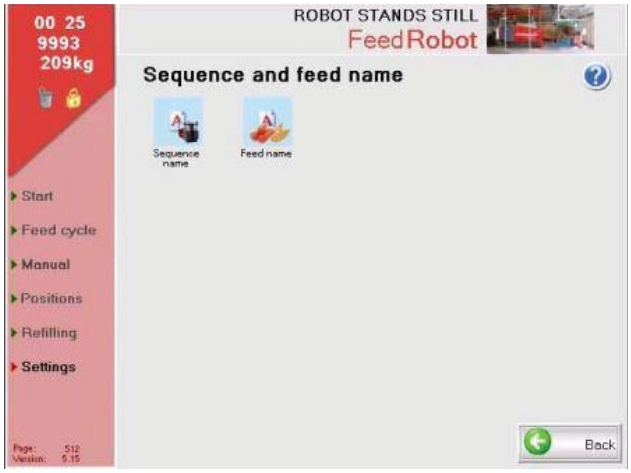
The dissipation time is the **"waiting time"** from the time the signal switches off until the robot moves on.



Side 102 **Side 199** **Side 100**

Feed zone number 1

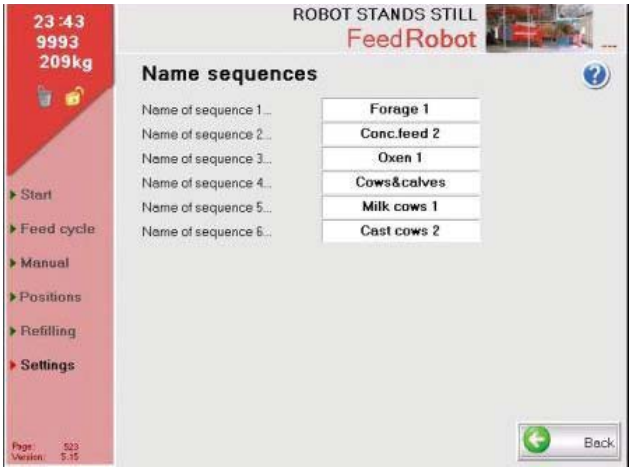
- You can store or modify the start and stop positions for the current feed zone here.
- Here you can also decide which side of the machine to dispense from.
- The robot first dispenses feed from the left with positive values on counter wheel 1.
- The values for the right side are negative.



Side 512

Sequence and forage type names

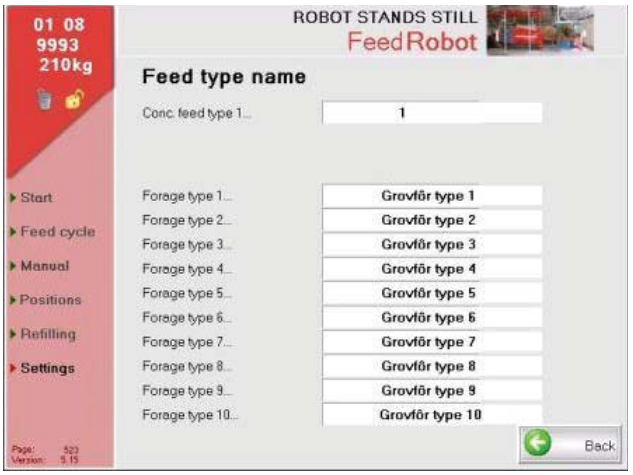
Feeding sequences and forage types are named here.



Side 523

Name feeding sequences

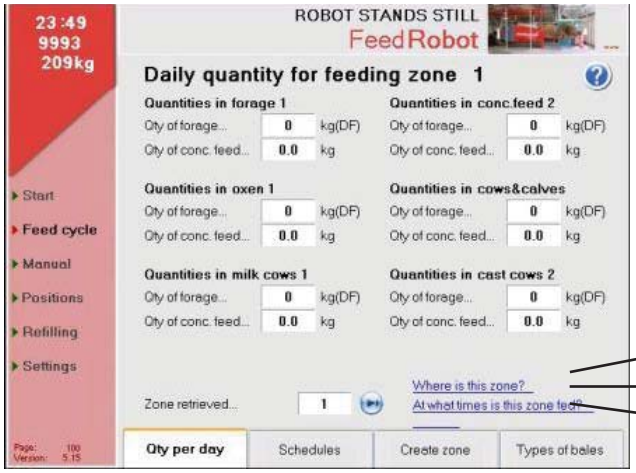
Aktiver det
Activate the white field. You will see a number of suggested sequence names. Select your preferred name.



Side 524

Name feeding type

Activate the white field.
Enter the name of the forage type here.



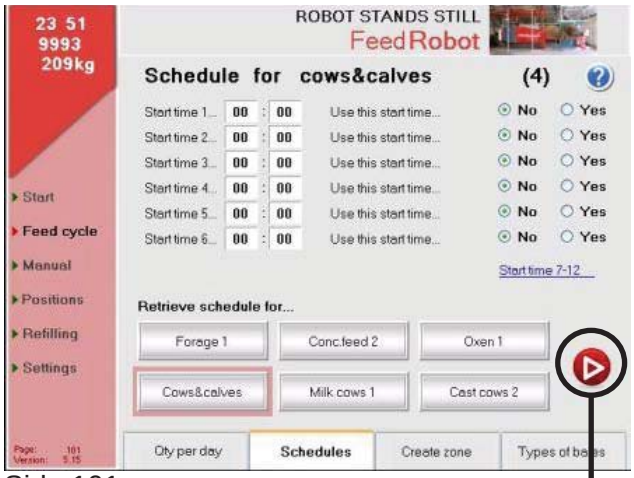
Side 100

Side 199
Side 102
Side 101

Feed zone daily quantities

Quantities per day for feed zones

Press **"Retrieve zone"** to show the current feed zone. You can enter quantities for all sequences on this page.
The total daily ration of forage and concentrated feed is shown in the box at the bottom of the screen.



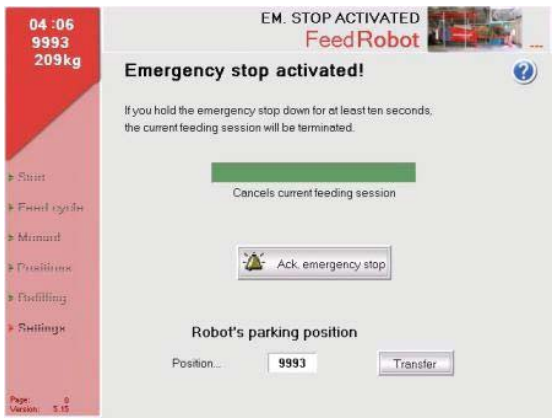
Side 101

A

Schedule for cows and young animals

Enter start times for each feeding sequence here, and also select whether this time is to be used.

You can press this button (A) to pause the feeding sequence.



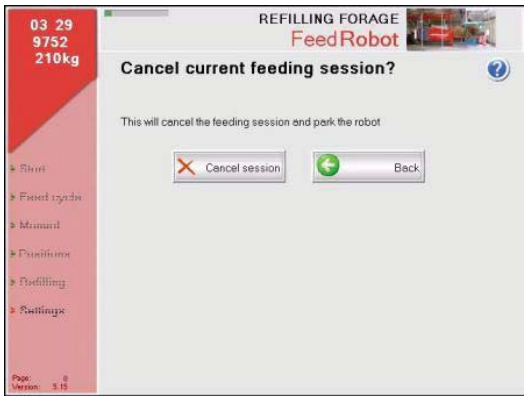
Side XXX

Emergency stop activated!

You can press this button (**A**) to pause the feeding sequence.

NB!

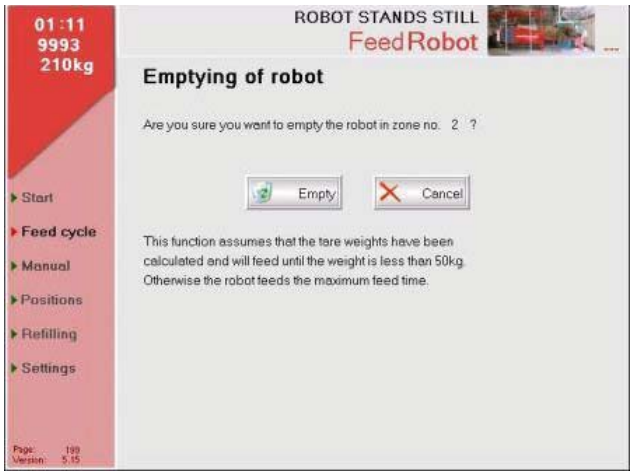
If the emergency stop is left until the green bar is full, it will return to its parking position after confirmation.



Side XXX

Cancel current feeding session?

Use this function to cancel the current feeding session.

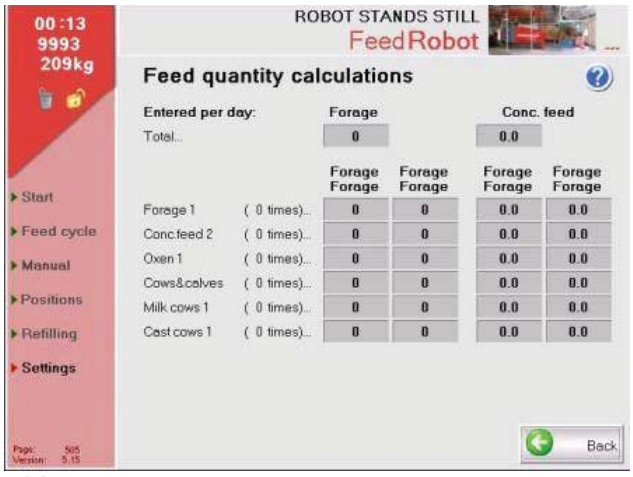


Side 199

Emptying of robot

Group feeding:

- If the robot is not completely empty, the empty button can be pressed.
- The robot will then move to zone no. 4 and will alternate until it is empty



Side 505

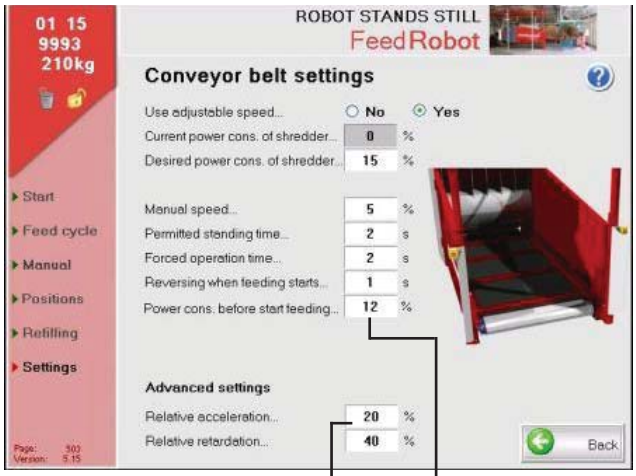
Feed quantity calculations

Summary of entered feed quantities and times. (Applies to the entire building)

Side 502

Bale data

To achieve optimal performance, the bale data should correspond to the feed you are feeding with as far as possible.
Experiment with different values on "press against shredder" to obtain the best results. Change the setting by 5% at a time and see if this is sufficient.
The shredding speed should not be altered except by prior agreement with authorised personnel. Select next bale type
If you choose to use this option the robot will automatically change the parameters. Depending on how
the bales are positioned. The parameters can be changed under Bale data.
The robot always reverts to the same parameters after 8 bales have been dispensed.
This can be changed at the bottom of the page



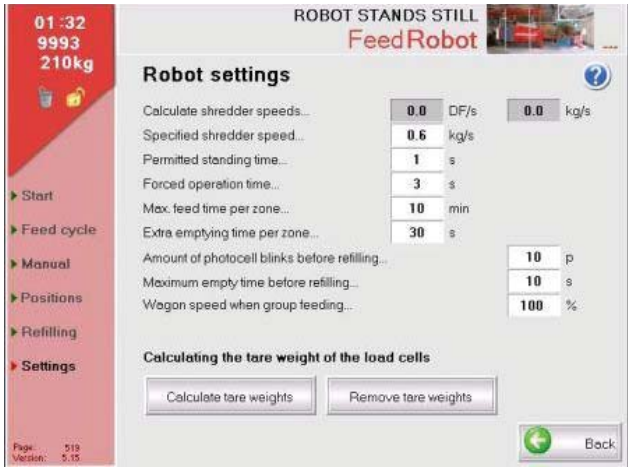
Side 503

Conveyor belt settings

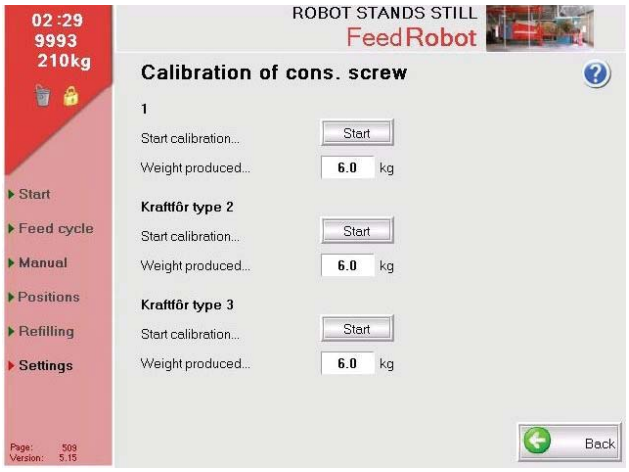
"Use adjustable speed":
NO: No adjustment, the speed of the conveyor belt is identical to manual operation.
YES: The conveyor belt speed is adjusted in accordance with the current bale data.
Relative acceleration can be adjusted in order to achieve
a faster reaction from the conveyor belt (**A**)

Please note that if the reversing time is too long the bale may get stuck behind a photocell.
The robot will assume it is empty and the robot will empty itself before moving to fetch a new load.

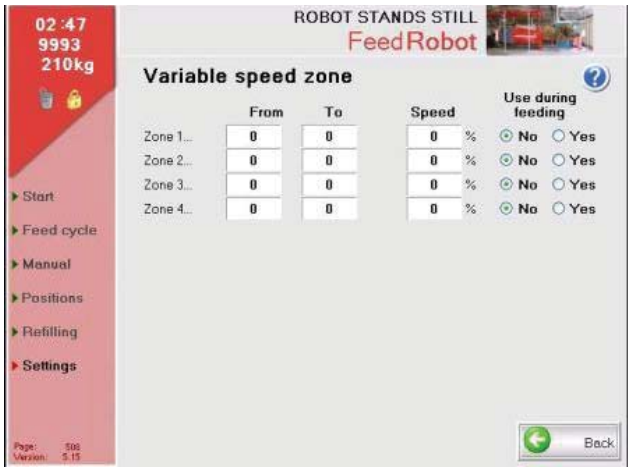
Wait time to achieve pressure in the drum before the robot begins the feeding session (**B**).



Side 519



Side 509



Side 508

Robot settings

NOTE! These settings must only be altered by authorised personnel.This is the default setting for ceiling rail operation when the robot dispenses too little forage (if it is not stationary it will change to forced **stationary** and **operating** times).
If the tare weight time is removed the same weight will occur on the display as on the weighing cell amplifier.

The tare weight is calculated by using this option. That means the weight is reset.
NOTE! Remember that the robot must be clear of forage and concentrated feed before performing this operation.

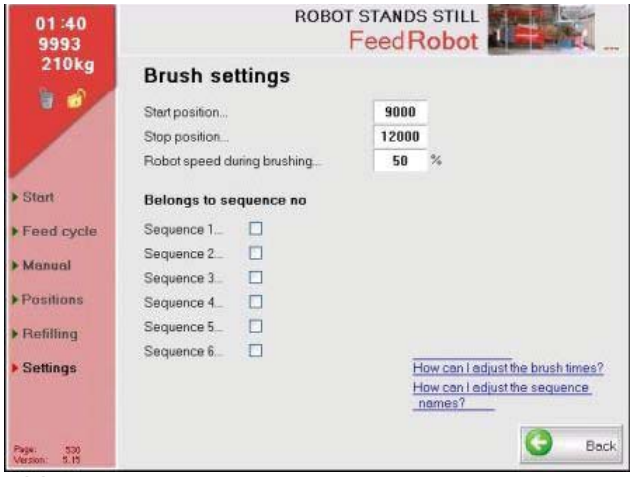
Calibrating the concentrated feed screw

The robot has been roughly calibrated at the factory. The robot must be calibrated at start-up and when changing feed type:
Click Start, fill the concentrated feed into a container/bucket and wait until the feed stops. Weigh the dispensed feed and enter the weight in the "Weight produced" field.
NOTE!
When calibrating the robot for the first time the feed pipe may be filled and the actual weight will therefore be incorrect.
You may want to repeat calibration several times to obtain the exact weight.

Adjustable speed field

These are used to reduce the speed of the robot.
This must be used when operating in a bend. Otherwise used at the end of a feed zone so that the robot manages to stop at the end.

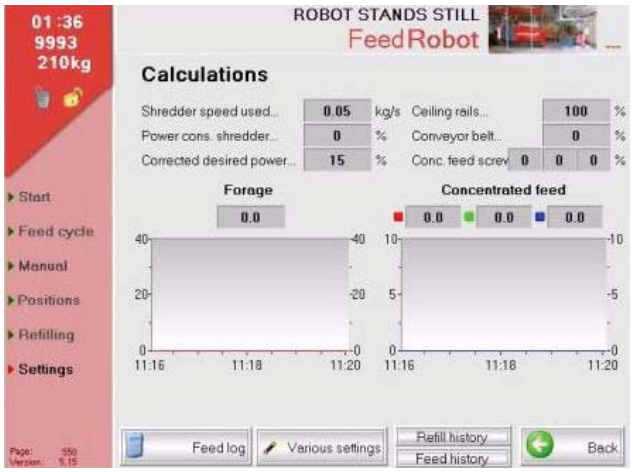
Typical speed is 40% in curves and at the end.



Side 530

Brush settings

When using the brushing sequence.
Enter the start/stop position and speed during brushing.
Select sequence.



Side 550

Calculations

This screen shows the power consumption of the machine.
This is used by service personnel.

Side 551

Miscellaneous

NOTE!

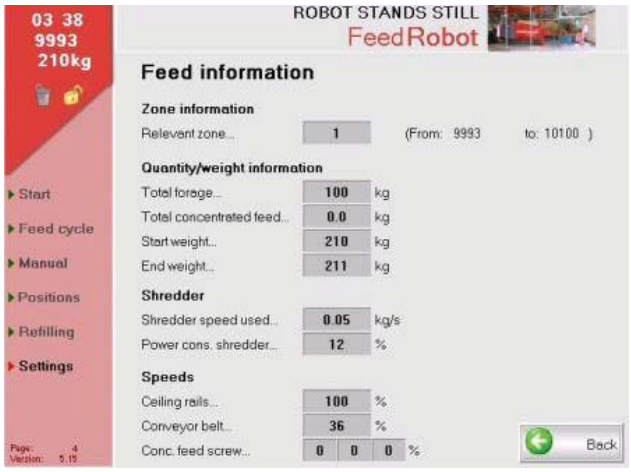
- Start drum with no load,
- look at the measured voltage,
- adjust voltage at 0% so that it is 0.2% over the middle voltage.
- Lubrication warning recommended for 10-hour lubrication interval.

03:35
9993
210kg
ROBOT STANDS STILL
FeedRobot
Refilling history
1 2 3 4 5 5 5 5 8 9
Start weight... 210 kg
Refilling now...
Ordered
TS
Final weight
Logged
Grovfôr type 1 100 kg 100 % 310 kg 0 kg
Grovfôr type 2 0 kg 100 % 0 kg 0 kg
Grovfôr type 3 0 kg 100 % 0 kg 0 kg
Grovfôr type 4 0 kg 100 % 0 kg 0 kg
Grovfôr type 5 0 kg 100 % 0 kg 0 kg
Grovfôr type 6 0 kg 100 % 0 kg 0 kg
Grovfôr type 7 0 kg 100 % 0 kg 0 kg
Grovfôr type 8 0 kg 100 % 0 kg 0 kg
Grovfôr type 9 0 kg 100 % 0 kg 0 kg
Grovfôr type 10 0 kg 100 % 0 kg 0 kg
Time above final weight ok.. 2 s
Back
Start
Feed cycle
Manual
Positions
Refilling
Settings

Side 3

Filling sequence

Filling display page.
Only if Group feeding is selected.
Used for service personnel.



Side 4

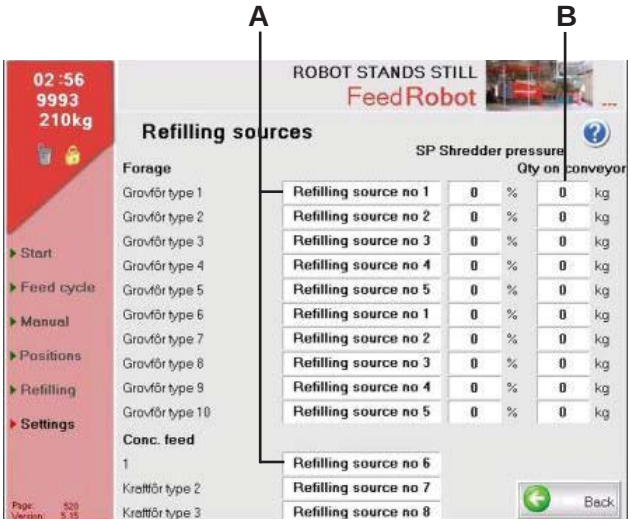
Feed information

Information about the feed dispensed in the zone in question.

Side 507

Filling

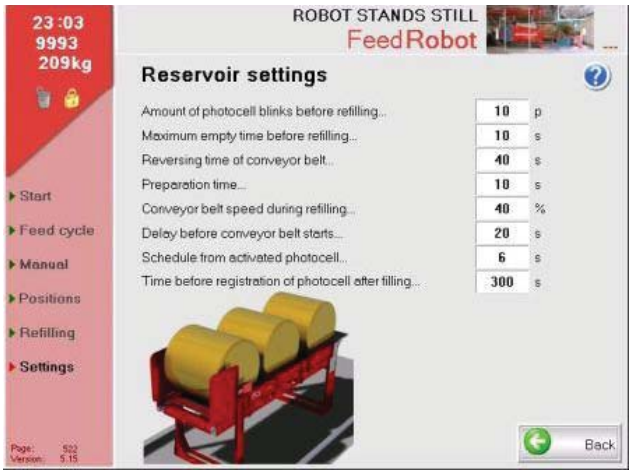
Choice of filling.
(If group feeding is not selected)



Side 520

Filling sources

(A) Enter forage and concentrated feed type.
(B) Volume remaining on transport belt after weight is achieved.

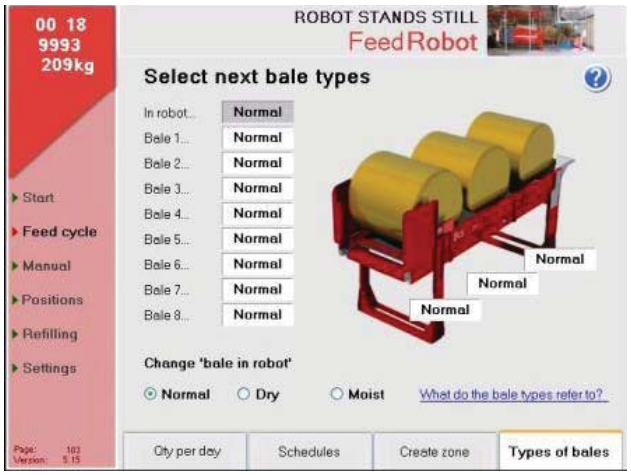


Side 522

Reservoir settings

You can fine tune the refilling data here.
The number of photocell flashes before the robot starts refilling can be set. (See photocell in the left door, reverse view).
If the maximum time for starting refilling is longer than the machine needs to feed one zone, the machine will not refill.
(This only applies if the conveyor belt stops)
Reversing time of the conveyor belt is the time required to empty the cart of any feed residue so that the residue does not confuse the robot during filling. (F.C.)
Preparation time is the time when the cart is stationary before it moves to the reservoir.

The feeding speed during refilling is the speed of the conveyor belt (the percentage should be reduced when dispensing silage blocks).



Side 103

Select next bale type

If you choose to use this option the robot will will automatically change the parameters. Depending on how the bales are positioned. The parameters can be changed under Bale data.
The robot always reverts after 8 bales have been dispensed.

Side 103

Forage dry matter content

Enter the dry matter content of the different types of forage here.
(For group feeding)

Side 506

Frost protection

If desired, the machine can be set to move at regular intervals when the temperature falls below 0.

Side 201

Lubrication interval!

The robot must be lubricated!
The warning that displays on screen when adjusting the lubrication interval (see Miscellaneous) is acknowledged by pressing "back".

NOTE!
Be very thorough about maintenance, lubrication and general cleaning.

3.4 Use of wireless control (router)

All new machines are now equipped with a router.

When a router is installed on an old machine, the network cable is run between the router and the machine's display. (Item no. 27560 contains the parts required).

Switch off the power to the machine (use the main switch) and wait until the display turns off.

Switch the power on. During the startup phase, you will see the machine's IP address.
NOTE! Write down the IP address.

Download Remote Access Viewer or VNC Viewer onto your PC
(You can find these programs on a memory stick supplied with the machine or on the Internet)

Follow the instructions for the program, and enter the IP address.
Look up the router on the machine.

Download Team Viewer onto your PC. (From memory stick or the Internet)
This way TKS or others can access the machine.

The K2 FeedRobot is now ready to be programmed from the PC.

4 Maintenance and care

NB!
Always pull out the plug before inspecting, maintaining or repairing the machine.

General information:

This equipment is used in a very exposed and aggressive environment. This will affect the use of the K2 FeedHopper and the equipment. Many different factors can have an impact on this, i.e. location, climate, feed type, humidity, silage agent, ventilation and not least maintenance/cleaning and inspection.

Equipment containing silo liquid, ammonia and other aggressive liquids/types of feed on an almost
continuous basis is liable to incur significant rust and oxidation damage if minimum maintenance is not carried out.

- You should clean the conveyor belt, cogwheels, axles and bearing casings as required and at least once a month.

- Do not tighten the conveyor belt to tight or askew.
  Ensure that drive chains are also kept tight. Check them regularly for slack or damage.

- Bearing journals and chains should be lubricated every 24 operating hours or at least once a month.

- Ensure that electrical equipment is not subjected to excessive temperature fluctuations. This can lead to condensation and short circuits.

- The oil in the worm gears should not be exposed to temperatures below minus 30 degrees C. If the machine needs to run normally at below -30° C, contact the manufacturer for advice and guidance

- The knives on the drum are made of tempered steel with a precision engineered cutting edge. Check the edge regularly for damage or wear and tear. You can sharpen the blades while the knives are still attached to the drum. This is easy to do by dragging an angle grinder across the inside of each.

4.1 Lubrication

Component / location		Quanti-	Action	Operating
1	Grease nipple - bearing operating side	1	Lubrication	10 h
2	Grease nipple - bearing return side con-	1	Lubrication	10 h
3	Grease nipple - bearing for drum	1	Lubrication	10 h
4	Grease nipple - bearing drum	1	Lubrication	10 h
5	Grease nipple - bearing conveyor belt	1	Lubrication	10 h
6	Grease nipple - bearing operating side	1	Lubrication	24 h

Oil change, worm

Amount 0,14 litre

AGIP	KLUBER	SHELL	MOBIL
Telium VSF 320	Syntheso D220 EP	Tivela Oil WB	Glygoil 30 SHC 630

Recommended grease: Ruysdael WR2 Q8 oils **Recommended oil:** Shell Tivela oil S-220

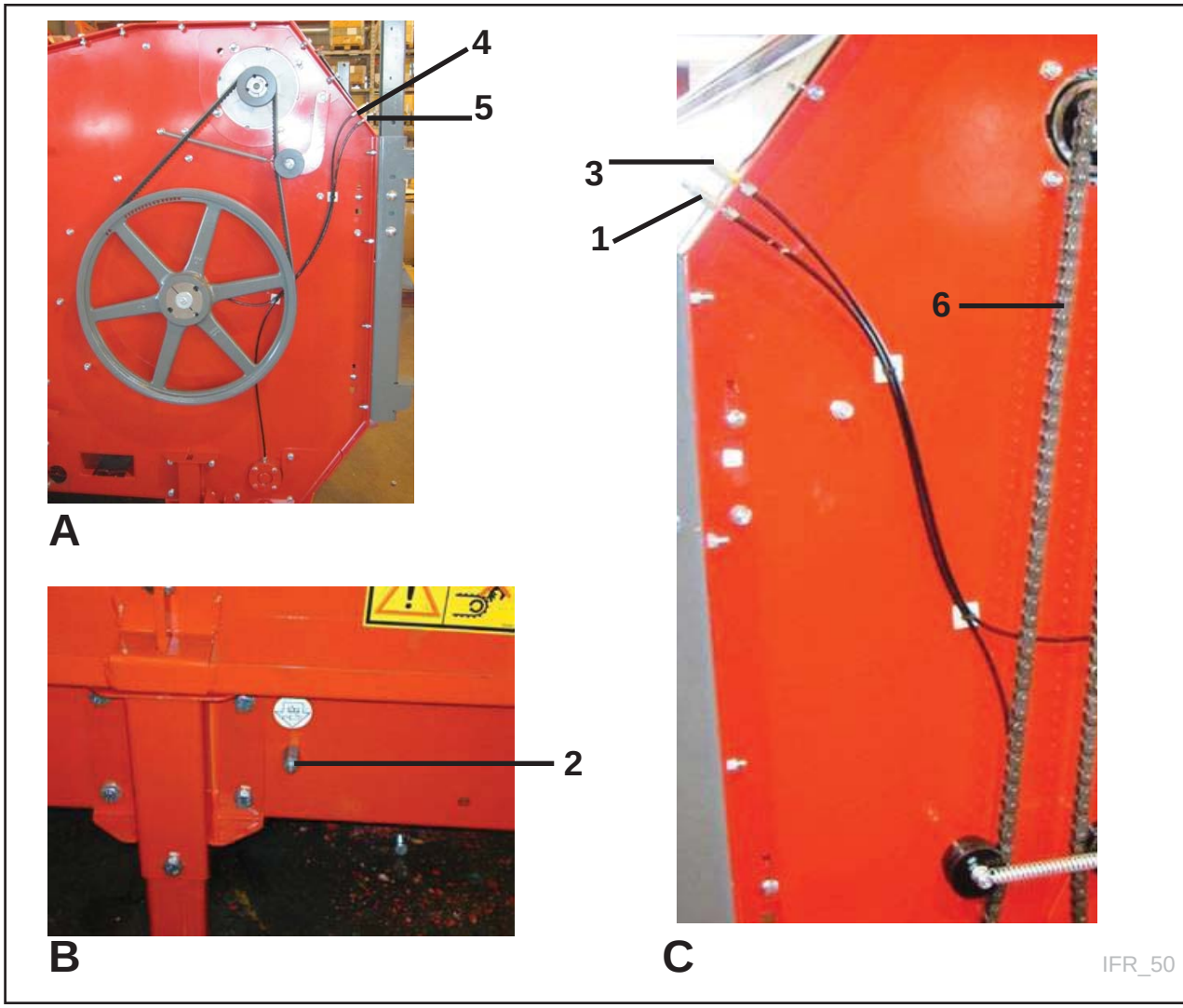


Fig. 80

4.2 Tightening the carrier belt

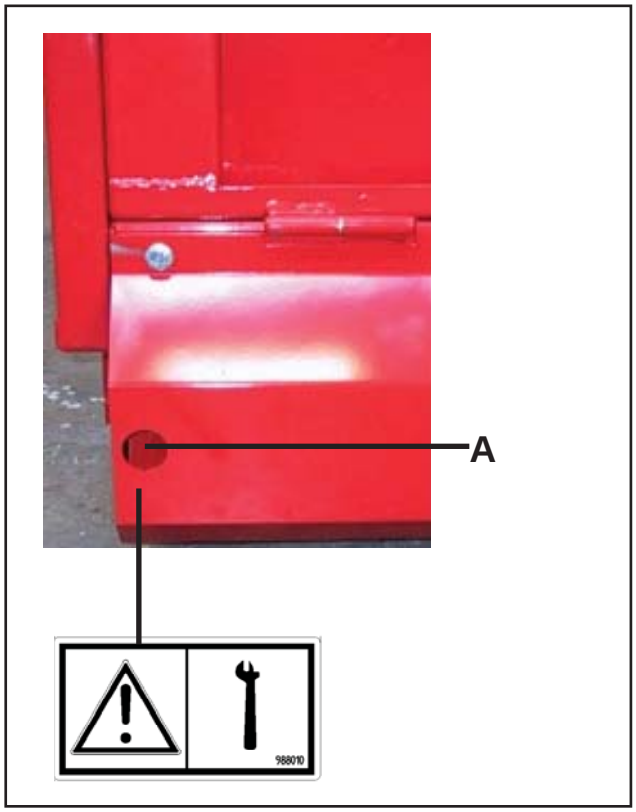


Fig. 81

It is important that the conveyor belt is taut. This should be checked at regular intervals. Tightening is performed by turning the tightening screw on the back of the machine. **See Fig. 81**

NB!
It is important to re-tighten the belt after just 1-2 bales/silage lifts, as paint etc. can be worn off and result in slack in the carrier belt.

Remember to turn the tightening screws on both sides an equal number of revolutions. Run the conveyor belt unloaded after tightening to check that everything works satisfactorily.

A Tightening screw

NOTE!

The bottom chain (B) must be tightened to the point that the
carrier can be seen from the side.
See Fig. 82

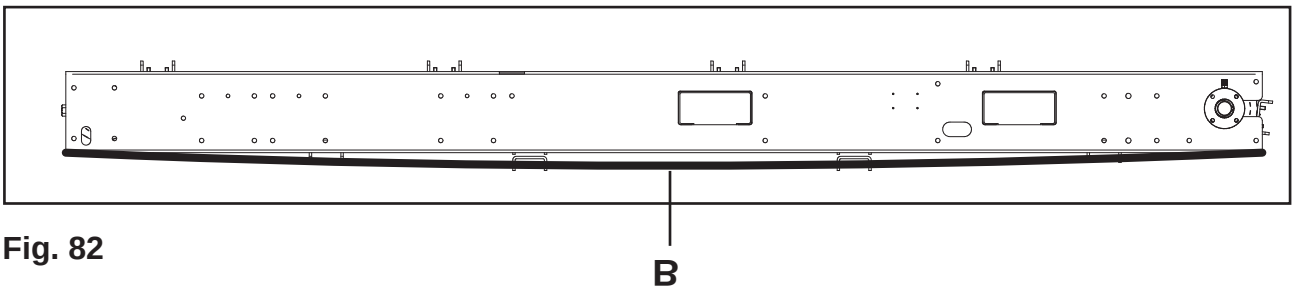


Fig. 82

Maintenance and inspection of current collector

It is recommended that the current collector is inspected after 1 month of operation, then every 1,000 km or once a year thereafter.

- Sweep the protective membrane along the conductor rail with a brush/sponge
- Inspect brushes
- Remove copper strip and clean
- Clean cart

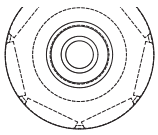
4.3 Service schedule for K2 FeedRobot

Before inspection or during work related to the machine, the following precautionary measures must be observed:

- Disconnect the mains voltage using the machine's main switch.
- Remove the fuse from the appropriate circuit.
- When working underneath the machine, the machine must be secured in order to avoid crushing hazards/falling.
- Do not work underneath a machine that is not secured..

Recommended maintenance cycles:
**1 = Weekly maintenance. Performed by user/service personnel.
****2** = Monthly maintenance. Performed by user/service personnel.
****3** = Annual maintenance. Performed by certified service personn
****4** = Bi-annual maintenance. Performed by certified service personnel.

Deviations with regard to the recommended maintenance cycles may lead to a reduced service lifetime and unwanted stoppages.

Component	***What to do?***	***Detail***	***Item number***
Conveyor belt:	***1 Clean chain wheel and axles.*		
Measurement **A** must not exceed 70 mm 	****3 Check chain wheels. Replace these in the event of damage or wear and tear. These should be replaced if the track exceeds 70 mm in length. NOTE! When replacing the chain wheel, the conveyor belt chain and links must also be changed.*	*K2 - chain wheel (drive wheel)* *K2 - chain wheel (return wheel)*	• *273079* • *265018*
	• ***2 Check chain/links* • *for wear* • *and damage. Tighten nuts on the links. A maximum of two links can be removed on each side before the chain must be replaced.* • *If the chain wheel is replaced,* • *the chain should also be replaced*	*K2 – Chain 17 links* *K2 – Chain 15 links* *K2 – Links x 20*	• *921471* • *921475* • *921420*

	***2 Tighten conveyor belt. Check conveyor belt tracks. The tension should be equal on both sides. The belt is tight enough when you can see the entire chain under the machine.* *NOTE! When replacing the chain, the chain wheel should also be replaced. Check the chain and chain tensioner.* *The chain and chain wheel must be oiled at all times.* *Special chain oil is used to this end.* *Check chain wheel for wear.*	*Drive-side conveyor belt:* *K2 – Chain lock ¾"* *K2 – Chain ¾"* *K2 – Chain wheel ¾" Z 12* *K2 – Chain wheel ¾" Z 28*	• *G50004* • *921483* • *270456* • *273237*
	***1 Lubricate all bearings; ensure that the bearings receive lubrication. Minimum 3-4 pumps with grease gun.* *Inspect all lubrication hoses.* *Replace defective/damaged lubrication points and hoses.*	*Recommended grease: Ruysdael WR2 Q8 oils or the equivalent*	
	**4 Check the oil level and check for leaks on the gear motor driving the conveyor belt. Clean the air plug.*	*Oil: Shell Tivela oil S – 220 or the equivalent* *K2 – gear motor conveyor belt*	• *2,1 liter*
Drum: (Roller)	****3 Inspect/lubricate the bearing for the roller. Turn the drum. Make sure that the blades do not touch the counter knife.*	*Bearing complete*	• *273017*
	Check the V-belt. *Replace these in the event of splintering, cuts, damage, etc.*	*K2 – V-belt*	• *922267*
	***1 Replace damaged or lost blades. Sharpen all blunt blades.* *From experience, sharpening should take place at least every 200 bales*	*K2 – blade set*	• *27080*
	***2 Check roller screens for damage/ wear. Make sure that there is no material/silage between the end of the roller and the side of the generator. Remove unwanted material.*	*Inner screen*	• *270045*

Roof operation: (traverser carriages)	*NOTE! At one rail mount, it must be checked that safety chains are in place in order to prevent accidents, should the bearing bolt break.* ***1 Tighten and lubricate the chain. Replace if worn.* ***3 Check the running wheel/running wheel bearing* *. The spacing between the rail flange and the running wheel should not ex-*	*K2 – Chain* *K2 – Chain lock*	• *921501* • *921502*
	***3 Check angle gear (worm) for leaks.* *Check bolts and their mounting.*	*K2 – worm*	• *409025*
	***1 NOTE! The thrust bearing (swivel) of a rail must be well lubricated; also check that the suspension bolt pin is in place and well secured.*	*Bearing* *Pin*	• *932002* • *921605*
	***3 Oppheng kontrolleres. Bolter og forbindelser kontrolleres og etterstrammes.*		
	***4 Inspect, clean and check the functionality of the pulse wheel (transmitter wheel) (minimum pulse wheel diameter = 73 mm)* *Check the functionality of the pulse wheel's pressure loading spring. (make*	*Transmitter wheel* *Spring*	
Side dispenser:	***2 Remove rubber belt. Clean drums and body*	*K2 – belt L 3760 mm* *belt L 2760 mm* *belt L 2160 mm*	• *270343* • *270320* • *270314*
	***3 Inspect/lubricate the bearing for belt drums*	*Bearing*	• *932505* • *409015*
	***1 Visual inspection of rubber belt. Tighten as needed (self-tightening)*		

	***3 Check worm gear for leaks.*	*K2 – worm*	• *409015*
Concentrate tank:	***2 Check capacitive transmitters and clean them.*	*Capacitive transmitter*	• 82165
	***2 Clean old concentrated feed out of the tank.*		
	concentrated feed out of the tank	*Inductive transmitter*	• 916162
	***4 Check the motor, transmitter, and cables for damage.*		
Electrical condition:	***4 Check cables for breaks, pinching damage, wear, and possible chew marks from mice and rats.* ***1 Carry out function tests on all emergency stop devices.*		
	***4 Check settings of motor protection device (thermal) in accordance with the motor's rating plate.* *Start the motor manually. Press and hold the blue button on the protection device until the motor stops. (does not apply to protection devices that are connected to frequency converters)*		
Conductor rail	***3 Check the copper strips in the conductor rail. If they are corroded, you can contact TKS to rent a cleaning trolley.*		
	***4 Possibly check whether the heating cable of a cleaning trolley is working*		
	Check to make sure the heating cable is working. *If not, check the voltage supply/possibly dimensions.*		
Weighing cells:	***3 Check that these are working as they should by using a defined weight.*		
	Remove the tare and make sure that the weight in the weighing cell amplifier and the weight shown on the display correspond.		

	The weight should not display negative values.		
	If necessary, recalibrate the weight. See section in the instruction booklet dealing with the calibration of weights.		
Photocells: (empty robot)	***1 Clean dust and dirt off the plexiglass; test its functionality and adjust as needed.*		
Filling signals:	***1 1 Make sure that the brushes/ switches and transmission surfaces have been sufficiently cleaned of tarnishing/corrosion. Check slide transmission surfaces and adjust as needed. (Only applies where wireless filling control is not used. E.g. radio control)*	*Carbon brush*	• *1410521*

4.4 Troubleshooting the K2 FeedRobot

****1 =** If the overload relay or protection has been knocked out due to overload, motors **MUST** be cooled down sufficiently before restart. (minimum 20 minutes).

It will be possible to check for most of these errors using the **"Service / Test"** page under the **"Manual"** page. See separate section for this page. Please note that for the errors listed below, the guide is based on **"possible causes"** and there may be other errors not listed in this section

Fault	***Causes***	***Procedure - error correction***
The display shows "Automatic cut-out"	• *Input signals for positions are missing. Input module –A1.1 light diode no. 10 and 11.*	• *The robot is prevented from running because of a mechanical obstruction. Remove any obstructions on and along the track.* • *Ensure that the counter wheel (transmitter sensors) transmit signals to –A1.1 sockets 10 and 11 on PLS. This can be done by turning the counter wheel manually.*
The display shows "Motor fault" – shredder generator	• *Input signal for operation of shredder* • *generator is missing. Input module –A1.1 light diode no. 1* • *Ref. separate section for "Troubleshooting Soft starter" page 95, or in the event of contactor start, check the* • *contactor.*	• *The overload relay (protection) in the soft starter or the overload relay (protection) associated with the contactor has been activated due to overload or because* • *voltage fluctuations are too great. Check light diode status on soft starter – UM1* • *Remove/rectify the cause of* • *the overload. The cause could be material preventing the shredder drum from starting or the conveyor belt feeding too hard against the shredder drum.* • *Reset the fault on –UM1 and on the display.*
The display shows "Motor fault" – ceiling rail fault	• *Input signals for "Ceiling rail operation" are missing.* • *Input module –A1.1 light diode no. 7 and 8*	• *Check alarm status on* • *the frequency transformer – UM5.* • *If the frequency transformer displays a fault, it can be corrected in accordance with the description given in "Frequency transformer"* • *(NB. Activating the emergency stop switch on the machine for approx. 1 minute will reset all alarms in* • *the frequency transformer) (**1)* • *Reset overload relay –Q5.1 and Q5.2. These may be triggered if overloaded.* • *Logical input LI6 on* • *frequency transformer will then be broken, and the display in the transformer shows "nSt".*

The display shows "Motor fault" – conveyor belt	*Input signals for* • *"Conveyor belt operation" and/or* • *"Conveyor belt fault" are missing.* • *Input module –A1.1 light diode no. 2 and 3*	• *Check alarm status on the frequency transformer – UM2. If the frequency transformer displays a fault, it can be corrected in accordance with the description given in "Frequency transformer" page 90* *(NB. Activating the emergency stop switch on the machine for approx. 1 minute resets all the alarms in the frequency transformer) (**1)*
The display shows "Motor fault" – side dispenser	• *Input signal for "Side dispenser* • *operation" and/or* • *"Conveyor belt fault" is missing. Input module –A1.1 light diode no. 4 and 5*	• *Overload relay –Q3 has been triggered because of overloading. Eliminate the cause of the overload.* • *Check the rotation of the belt for side dispenser worm gear and/or check for motor faults.* • *Check the side dispenser contacts.* • *To be carried out by authorised* • *personnel*
The display shows "Motor fault" Concentrated feed screw fault	*Input signals for "Pulse concentrated feed screw" are missing. Input module –A1.1 light diode no. 6. ref*	*Check mechanical joints and check for screw blockages. Check that the pulse star and transmitter sensor are working and that they are transmitting signals to PLS. Check that the relay function –K4 is working properly. To be carried out by authorised personnel Check the motor for screw(s), motor brush for wear.*
The display shows "Motor fault" "Reset fault"	• *Input signal for* • *"Reset position transmitter" is set to constant Input module –A1.1 light diode no. 12.*	• *Check that the reset switch does not "hang".* • *Check that the input signal on module –A1.1 light diode no. 12 is off by disconnecting the cable from the switchboard.*
The robot is out of position	• *The counter wheel is counting incorrectly or not working properly*	• *Move the robot towards reset 1 to check the actual position. Stop before the reset switch touches the* • *reset impactor and check for any deviations. If there is a significant deviation, check the spring pressure on the counter wheel, its rotation, distance to transmitter sensor (3 mm)* • *Switchboard and cable connections.*

The robot stops and "hangs" during feeding sequence	• *Faulty voltage input / phase fault*	• *Check voltage input. When using the conductor rails, check the contact between* • *current collector and conductor rail.* • *Press the stop switch, turn off and on the voltage input and reset the stop switch.*
The robot does not notice that it is out of forage (only applies in case of automatic refilling)	• *Input from photocells is missing.* • *Input module –A1.1 light diode no. 15*	• *Check that there are* • *no particles preventing a clear view* • *between photocell transmitter and* • *receiver when the robot is empty.* • *Clean the protective glass.* • *Check light diode status on photocells* • *. The light diode on the transmitter is red.* • *The light diode on the receiver displays green and orange when there is a connection (clear view) between*
The robot does not notice that it is out of concentrated feed (only applies in case of automatic refilling)	• *Input from lower capacitive* • *sensor does not switch off.* • *Input module –A1.1 light diode no. 9* • *NOTE! If filling manually or on start of sequence, this transmitter will not be applicable.*	• *Inspect/clean lower capacitive sensor in concentrated feed tank for dust and similar.* • *Check cable for damage that could cause short circuit.* • *Check sensor operation – replace it if necessary.* • ***NOTE! The sensors in the concentrated feed tank should be cleaned regularly to prevent faults in relation to automatic refilling of concentrated feed.*** •
The robot does not notice that it is full of concentrated feed. (applies only for automatic refilling)	• *Input from upper capacitive* • *sensor is missing. Input module –A1.1 light diode no. 14* •	• *Inspect/clean upper capacitive sensor in concentrated feed tank for dust and similar.* • *Check cable for damage/cracks.* • *Check sensor operation – replace it if necessary.* • ***NOTE! The sensors in the concentrated feed tank should be cleaned regularly to prevent faults in relation to automatic refilling of concentrated feed.***

The robot stops in the concentrated feed refill position but refilling does not start.	• *No transmission of external 24 VDC signal.*	• *Check transmission from transmitter (brushes) to receiver (copper tracks). Clean contact surfaces with a suitable cleaner if necessary.* • ***NOTE! Power must be switched off when cleaning.*** • ***Check output signal from PLS –A1.3***
The robot moves to refill forage from reservoir R1 but the reservoir does not start. (applies only in the event of mechanical signal transmission)	• *Faulty reservoir start switch/ activation. (rail-mounted)*	• *Check switch position and impactor and check that the cart "docks" properly with the reservoir.* • *Test switch by activating it manually.* • *Check input signal for reservoir operation*
The display is not working. No text or light.	• *Faulty power supply to* • *the display*	• *Check power supply to the display –G2. The light diode on the power supply should be green.*
Faulty power supply. Green light diode is not lit.	• *Faulty analogue input PLS –A1.4* • *Input 0-1* •	*Disconnect power supply and identify and rectify short circuit. The fault is caused by components or cables short-circuiting. Contact authorised personnel.*
"1 com err stn 00" is flashing on the display	• *Communication between display and PLS has been interrupted*	• *No 24VDC power supply to PLS. No light diodes are lit in PLS.* • *Defective communication inputs. Check connections between PLS and Display.* • *Contact authorised personnel.*
Adjustable speed conveyor belt is not working:	• *Incorrect settings. Adjustable speed is switched off.* • *Faulty analogue signal (0-10V)* •	• Check conveyor belt speed settings. • Check analogue signal from –P1 (Power transducer) outputs 1 and 2 • (0-10 VDC). To be carried out by authorised personnel. • Start shredder drum manually and • check "Active power output in shredder" in the conveyor belt menu. Shows output in %

Ceiling rail adjustable speed is not working	• *Faulty analogue signal to the frequency transformer –UM 5*	• Check analogue signal (0-10 V) to the frequency transformer –UM5, input AI1 and Com. • To be carried out by authorised personnel
Weight is not working (faulty display) **Only applies to robots fitted with weighing cells**	• *Faulty analogue input PLS –A1.4* • *Input 0-1* •	• Tare weight (settings menu – Robot – Weighing cell tare weight) • Check this weight against the known weight. (tolerance +/- 10 kg) • Inspect weighing cells and cables for damage • Calibrate weighing cell amplifier again. • To be carried out by authorised personnel
The display shows "Emergency stop activated" and "Confirm emergency stop" is not working.	• *Input signal for* • *"Emergency stop OK" missing.* • *Input module –A1.1 light diode Refers to Service/test menu*	• Check emergency stop switches (x3 – 1 at the front and 2 at the back) • Check cable for damage/cracks. • Turn off main switch for 60 seconds. • Switch on power, reset the emergency stop button and confirm on the display.

4.5 Troubleshooting the frequency inverter

The frequency transformer does not start, no error message is shown

- If there is no light on the display, check the mains supply to the frequency transformer.

- If the Quick Stop or Free Rollout functions have been allocated to one of the logical inputs, which in turn have not been activated, this could be the reason why the frequency transformer does not start.
- The transformer display will then show "nSt" for free rollout and "FSt" for quick stop.
- This is quite normal as these functions are activated when there is no signal on the input
- (also acts as a safety barrier in the event of broken signal circuits).

- Check that the input(s) for the start signal is/are activated in relation to the selected control type (parameter tCC in the I-O- menu).

- If an input has been allocated to deal with the signal from the end switch, and this input is receiving no signal, the frequency transformer can only be started by giving a start signal for reverse
- direction of rotation.

- If the reference channel or control channel has been configured for Modbus or can open, the display will show nSt when the mains supply is turned on, and the frequency transformer remains blocked until a start signal is sent via the communication bus.

Faults that cannot be reset automatically

The cause of the fault must be identified and rectified before the frequency transformer is reset by turning the mains supply off and on again

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A - Choice of keys
B - Leave menu
C - Press to go to the menu
D - Press to confirm values

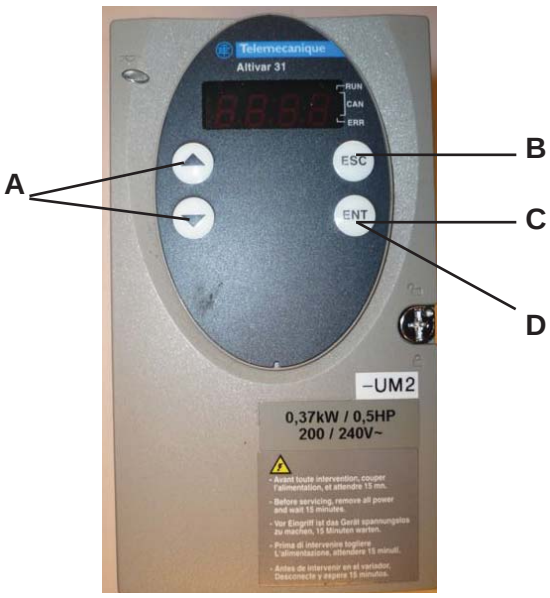


Fig. 83

Fault	*Causes*	*Procedure - error correction*
bLF Faulty brake control	• *The power level for freeing the-brake has not been achieved* • *The frequency level for freeing the brake has not been set (bEn = nO) when the brake control function blC is activated.*	• *Check the connection on the frequency transformer/motor.* • *Check the motor windings.* • *Check parameter settings lbr in the **FUn** menu* • *Set the recommended value for parameter **bEn.***
CrF Faulty charging circuit	• *Faulty charging relay or defective* • *charging resistance*	• *Replace the frequency transformer*
EEF EEPROM fault	• *Internal memory fault.*	• *Check the surroundings (electromagnetic compatibility)*
InF Internal fault	• *Internal fault in frequency transformer*	• *Check the surroundings (electromagnetic compatibility)* • *Replace the frequency transformer.*
OCF Overcurrent	• *Incorrectly set parameters in SEt- and drC menu lights on the left hand side and 1 light on the right hand side when the robot is empty.* • *Mass inertia or excessive load* • *Mechanical obstruction of machines*	• *Check parameter settings in the* • ***SEt and drC menus.*** • *Check mechanical condition*
SCF Short circuit in motor circuit	• *Short circuit or earth fault in the frequency transformer output* • *Significant leakage to earth when multiple parallel connected motors are connected to the frequency transformer*	• *Check cable between the frequency transformer and motor along with motor insulation.* • *Reduce the switch frequency* • *Fit a motor current limiter between frequency transformer and motor*
SOF Excessive rotational speed	• *Instability or* • *Driving load is too great*	• *Check motor and parameters for reinforcement and stability.* • *Fit brake resistance.* • *Check the size of motor/frequency transformer/load.*

tnF Faulty auto tuning	• *Special motor or motor with an output unsuited to the frequency transformer* • *Motor not connected to the transformer*	• *Use voltage/frequency ratio **L or P*** • *Check that the motor is present during auto tuning.* • *If a contact is used between the frequency transformer and motor it must be closed during auto tuning*

Faults that can be reset with an automatic reset function once the fault has been eliminated.

Fault	*Causes*	*Procedure - error correction*
COF ***CANopen fault***	• *Interference or interruption to communication in **CANopen bus***	• *Check communication bus.* • *Please use the relevant bus documentation.*
EPF ***External fault***	• *In relation to faults defined by user*	• *Defined by user*
LFF **Broken 4 – 20 mA loop**	• *Broken 4- 20 mA reference signal on input A13*	• *Check the connection on the analogue input **A13.***
ObF ***Overcurrent under retardation***	• *Braking too quickly or driving load*	• *Increase retardation time.* • *Fit brake resistance if necessary.* • *Activate **brA** function if compatible with the application*
OHF Overheating of frequency transformer	• *Frequency transformer overheats*	• *Check the motor load and that the frequency transformer cooler is cool before it is restarted.*
OLF ***Motor overload***	• *Triggered because of excessive load current*	• *Check the **ItH** parameter setting (motor is cool before it is restarted).*

OPF Broken connections in one or more motor phases	• *Broken connection in one of the motor phases* • *Motor contact is exposed* • *Motor not connected or motor power too low* • *Momentary instability in the motor's load current*	• *Check the connection from the frequency transformer to the motor.* • *If a contact is fitted between the transformer and motor, set **OPL to OAC** (Flt menu)* • *Test on a motor with low output or without a motor: The phase interruption protection in the motor circuit has been activated **(OPL = YES)** in the factory settings. In order to inspect the transformer during testing or maintenance without having to connect a motor with the same output as the transformer (particularly for high outputs), deactivate this protection **(OPL = NO)*** • *Inspect and optimise the parameters UFr, UnS and nCr and perform auto tuning with parameter **tUn.***
OSF	• *Network voltage is too high* • *Interference with network voltage*	• *Check the network voltage.* • *Contact the electrical utility if it is too high.* •
PHF Broken connections in one or more network phases	• Fault in supply voltage or fuse failure • Fault in one of the network phases • An ATV31 for 3-phase supply is used on a 1-phase network • Unbalanced network The protection is only active when the frequency transformer is loaded.	• *Check the network connection and network fuses.* • *Reset* • *Use 3-phase network voltage* • *Disconnect the fault type, set **IPL = NO (FLt menu).***
SLF Modbus fault	• *Interference or interruption in* • *Modbus communication*	• *Check communication bus.* • *Please use the relevant bus documentation.*

Faults that can be reset as soon as fault cause has been eliminated

Fault type	*Possible causes*	*Procedure for rectification*
CFF *Configuration fault*	• *The current configuration is self-contradictory*	• *Revert to factory settings or retrieve back-up* • *configuration if it is valid.* *See parameters in* ***FCS in the I-O-, CtL or FUn menus.***
CFI	• *Incorrect configuration* • *The configuration downloaded via a serial connection is self -contradictory.*	• *Check the last downloaded configuration.* • *Download a valid configuration.*
USF Undervoltage	• *Network voltage is too low* • *Brief drop in voltage* • *Defective charging resistance*	• *Check the voltage and voltage parameters.* • *Replace the frequency transformer.*

A complete user guide can be sent on request.
An overview of the parameters used for the individual frequency transformer can be found in the electrical documentation (circuit diagram).
.

4.6 Troubleshooting soft starter

Faute	*Causes*	*Procedure - error correction*
Soft starter fails to start after the start command is given	• *The light diode is off.*	• *Check whether there is control voltage to the soft starter.* • *Check whether the start condition to the soft starter is activated* • *Check whether there is voltage to the soft starter*
	• *The light diode is on:*	• *Check whether the contactor forward of the soft starter settles properly*
	• *The light blinks 1 - Overload*	• *Reset overload*
	• *2 - High temperature*	• *Trips when temperature is too high; soft starter must have time to cool off.* • *Check the load you are working with in relation to what the soft starter is set to.*
	• *4 - Error at phase in or no load coming from the soft starter*	• *Make sure that all phases are reaching the soft starter. Check whether there is a break in phases between the soft starter and the motor*
	• *5 - Imbalance in the phases*	• *Measure the power in the phases; the maximum permissible deviation between phases is >65% before the soft starter protection trips*
	• *6 - Shorted soft starter (SCR)*	• *Perform a run-through test across the poles in the soft starter* ***(L1-T1, L2-T2, L3-T3).*** *Voltage in and connection out to the motor must be disconnected prior to measurement. Resistance must be over 10k Ohm over the soft starter.*

Configuration of DIP switch settings for the soft starter is described in the electrical documentation (circuit diagram).

4.7 Configuring/calibrating weighing cell amplifier
(Valid for serial number -360)

You need to measure the following to verify that the connection is correct:

Supply to the amplifier
Voltage between terminals 12 and 11 must be 24V

Excitation voltage
The weighing cells must be supplied with 4V. Voltage between terminals 1 and 5 must be 4V

Signal from weighing cells
The weighing cells emit a signal of approximately 2-5 mV. Voltage between terminals 2 and 3 must be 2-5 mV

Analogue output from amplifier
The amplifier emits an analogue signal of 0-10V. Voltage between terminals 8 and 10 must be 0-10V

- There are 9 switches on the amplifier, all of which are set to the up position.
- Press both buttons (1).
- "def" should appear in the display.
- This means that you have retrieved the factory configuration for the amplifier.
- After that, flip down all the switches apart from the one farthest to the right.
- Programming of the amplifier can now commence.

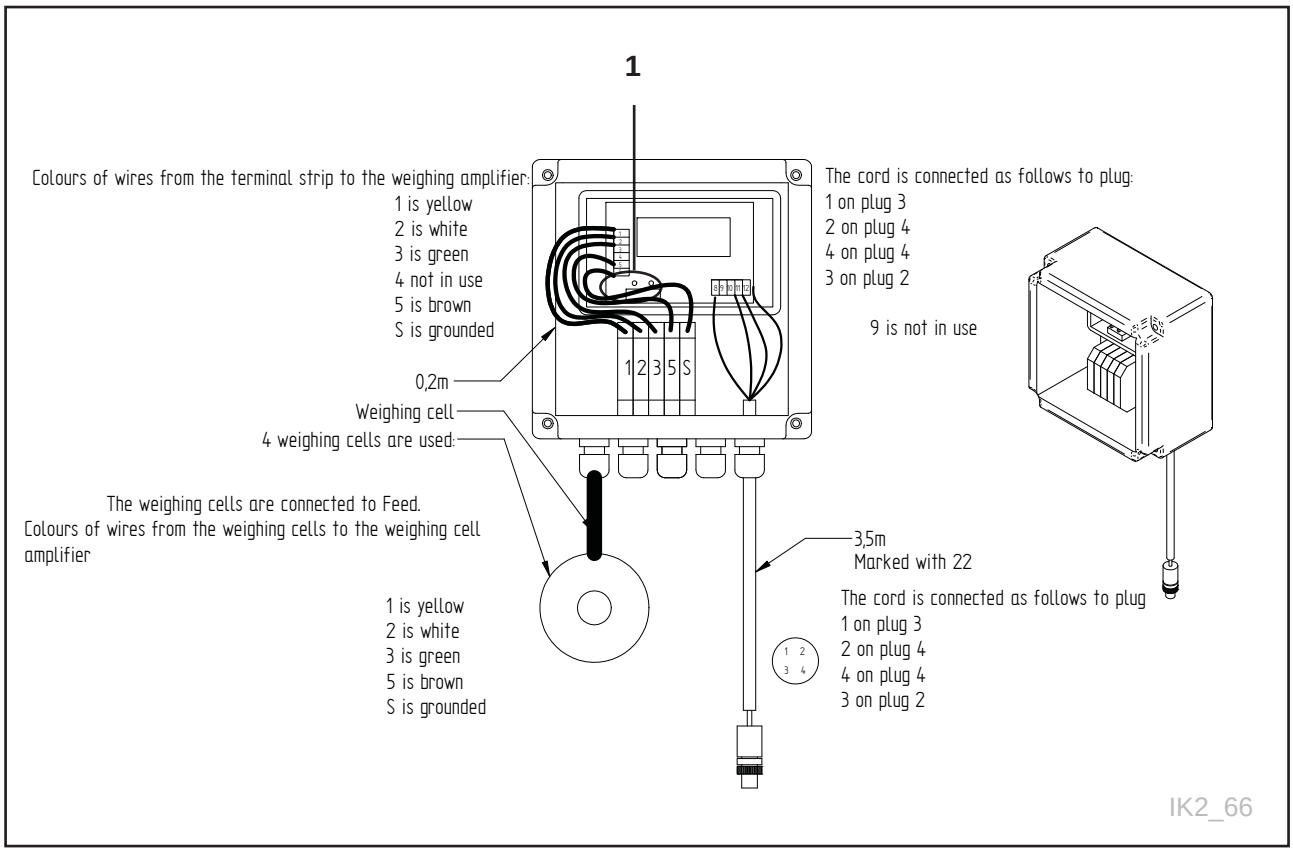

1
Colours of wires from the terminal strip to the weighing amplifier:
1 is yellow
2 is white
3 is green
4 not in use
5 is brown
S is grounded
0,2m
Weighing cell
4 weighing cells are used:
The weighing cells are connected to Feed.
Colours of wires from the weighing cells to the weighing cell amplifier
1 is yellow
2 is white
3 is green
5 is brown
S is grounded
1 2 3 5 S
The cord is connected as follows to plug:
1 on plug 3
2 on plug 4
4 on plug 4
3 on plug 2
9 is not in use
3,5m
Marked with 22
The cord is connected as follows to plug
1 on plug 3
2 on plug 4
4 on plug 4
3 on plug 2
IK2_66

Fig. 84a

Parameter	Do what?	Set to
3	Determine how many measurements are to be used in the filter.	15
4	An override function letting you make the filter skip if the value exceeds a certain limit.	150
23	How many weighing cells does the robot have?	4
26	Capacity in each cell. Read on the weighing cell.	1000/2500
34	The type of analogue signal desired. This PLS uses 0-10V.	U
38	What should the display on the amplifier show at maximum output (10V) When the PLS is programmed to measure 0-1500 Kg.	1500
49	Conversion speed. This is where we choose how many measurements the amplifier should use per second.	14 Hz
24	Here is where we select weight rising characteristics. Move this until you find the factor resulting in e.g. an 80 kg increase when you get on the scale. What this value is actually expressing is mV/V excitation. This is generally around 1.5 for most cells.	1,0-2,0
22	**Finish by noting down the weight shown. E nter this weight for this parameter. PS: It can be a good idea to get the weight to show 100 kg when the robot is empty,**	Value shown for the weight in the display at 0 load (empty cart) -100 kg

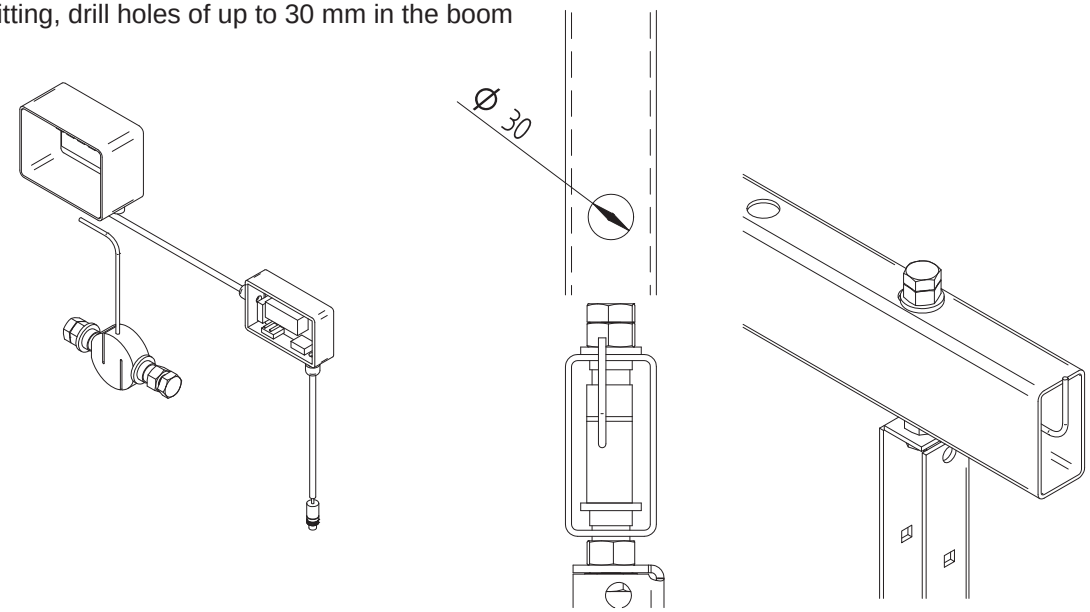
Once you have finished with parameter 22, the weight in the display should show 0, and reflect the appropriate increase when you step onto the machine. Stand in front of the machine.

4.8 Configuring the weighing cell amplifier

(Value from serial number 361-)

Confirm all choices by pressing both keys simultaneously.
Reset by flipping up all dipswitches and pressing both keys simultaneously, then press down all the switches except for
no. 8

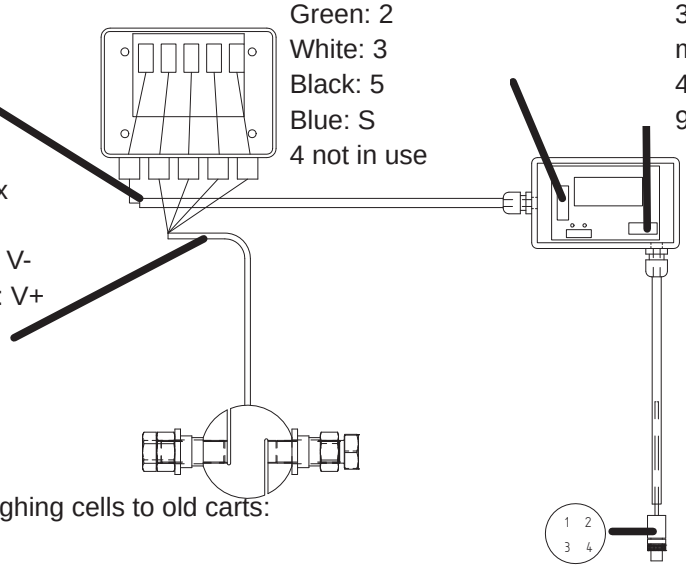
For retrofitting, drill holes of up to 30 mm in the boom



Cord from junction box and weighing cell amplifier is connected as follows:
Blue: SH
Black: V-
Red: V+
Green: S+

Cord from junction box and weighing cell amplifier is connected as follows:
Red: 1
Green: 2
White: 3
Black: 5
Blue: S
4 not in use

The weighing cell amplifier is wired as follows:
1 on 12, = 24V
2 on 11, = 0V
3 on 10, = Measure the measure voltage
4 on 8, = 0V
9 not in use



Weighing cells are connected to the box
Grounded: SH
Black/Blue together: V-
Red/yellow together: V+
White: S-
Green: S+

Connecting new weighing cells to old carts:
V + = 1
S + = 2
S - = 3
V - = 5
SH = S

The cord is connected as follows to plug:
1 on plug 3
2 on plug 4
4 on plug 4
3 on plug 2

Fig. 84b

Parameter	Do what?	Set to
3	Determine how many measurements are to be used in the filter.	15
4	An override function letting you make the filter skip if the value exceeds a certain limit.	150
23	How many weighing cells does the robot have?	4
26	Capacity in each cell. Read on the weighing cell.	2500
34	The type of analogue signal desired. This PLS uses 0-10V.	U
38	What should the display on the amplifier show at maximum output (10V) When the PLS is programmed to measure 0-1500 Kg.	1500
49	Conversion speed. This is where we choose how many measurements the amplifier should use per second.	14 Hz
24	This is where we select weight rising characteristics. Move this until you find the factor resulting in e.g. an 80 kg increase when you get on the scale. What this value is actually expressing is mV/V excitation. This is generally around 1.5 for most cells.	0,1 - 3,0
22	**Finish by noting down the weight shown.**	Value shown for the weight in the display at 0 load (empty cart) -100 kg

Once you have finished with parameter 22, the weight in the display should show 0, and reflect the appropriate increase when you step onto the machine. Stand in front of the machine.

Analogue output from amplifier

The amplifier emits an analogue signal of 0-10V. Voltage between terminals 8 and 10 must be 0-10V

9 switcher sitter på forsterkeren, og alle disse settes i oppover stilling.

- Begge knappene trykkes inn **(1)**.
- Det skal da komme opp **"def"** i displayet.
- Det betyr at du har hentet inn fabrikkoppsettet til forsterkeren.
- Ta deretter ned alle switchene bortsett fra den lengst til høyre.
- Programmeringen av forsterkeren kan nå starte.

4.9 Troubleshooting using code lights and PLS Prog. 5.xx

A lit diode means the function is working properly

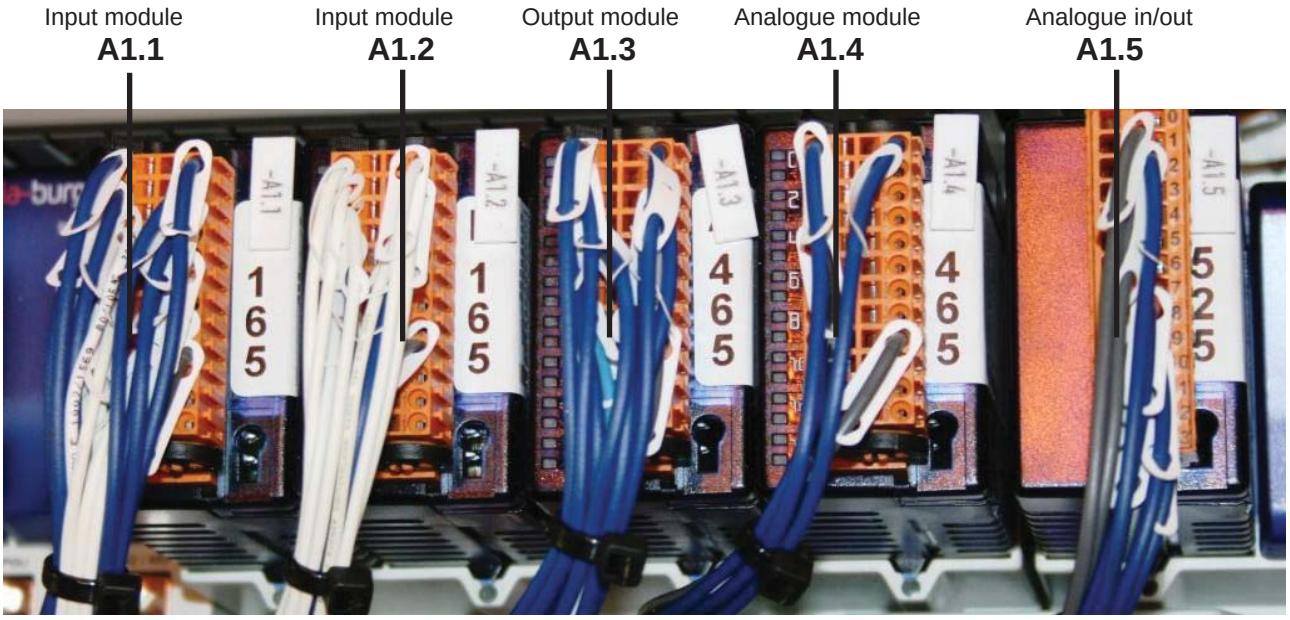


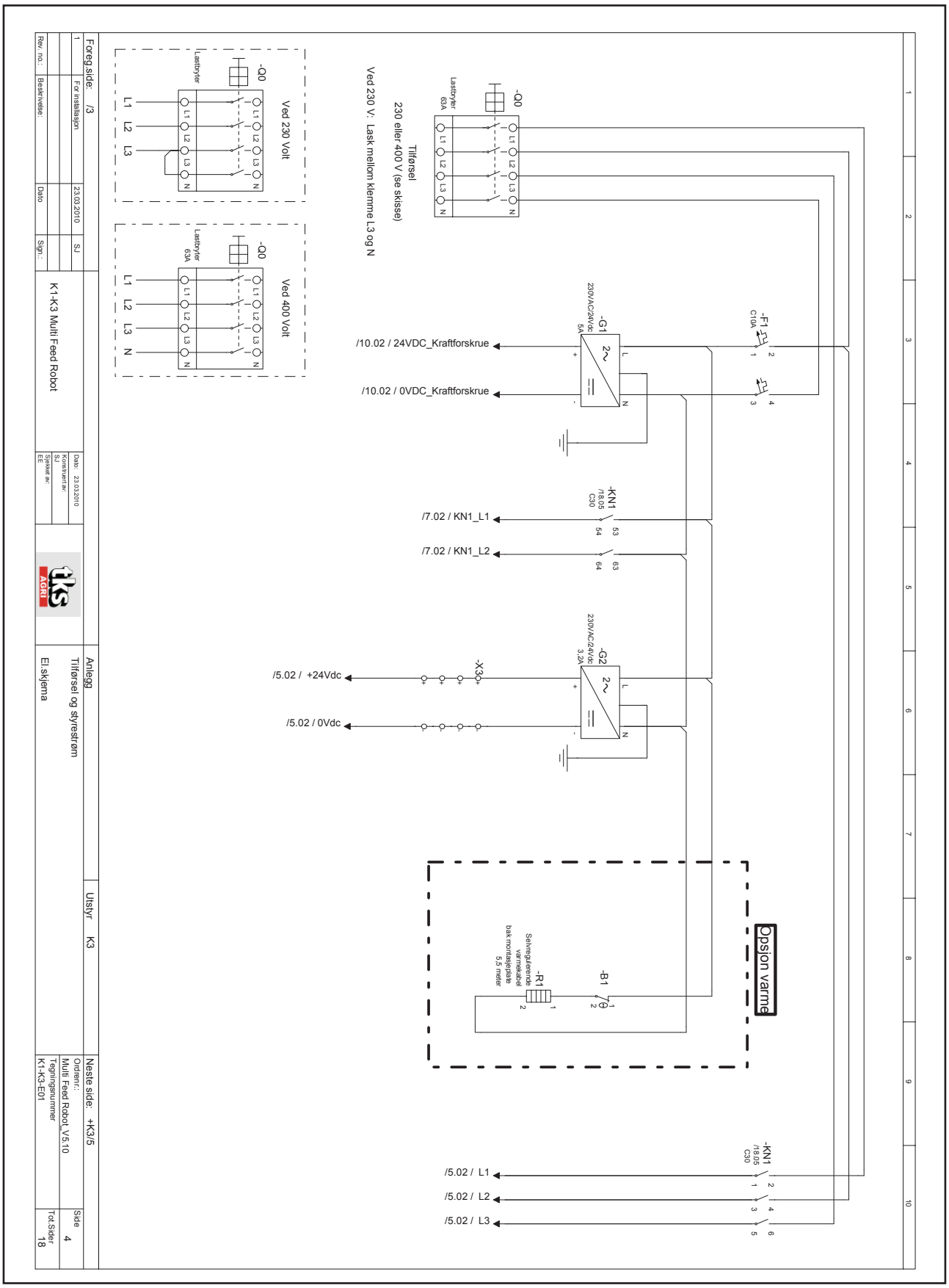
Fig. 85

	Light no.	Light no.	Light no.	Light no.	Light no.
	A1.1	**A1.2**	**A1.3**	**A1.4**	**A1.5**
Start shredder generator			0		
Output reading – shredder generator					2 - 3
Operation – shredder generator	1				
Operation side dispenser - right	4		2		
Operation side dispenser - left	5		3		
Conveyor belt speed					10 - 11
Start conveyor belt inbound			1		
Operation – conveyor belt			7		
Fault – conveyor belt	2				
Fault – conveyor belt	3				
Speed – ceiling rails					8 - 9
Start ceiling rail operation right			5		
Start ceiling rail operation left			6		
Fault – ceiling rails	8				
Operation – ceiling rails	7				
Start concentrated feed screw 1			4		

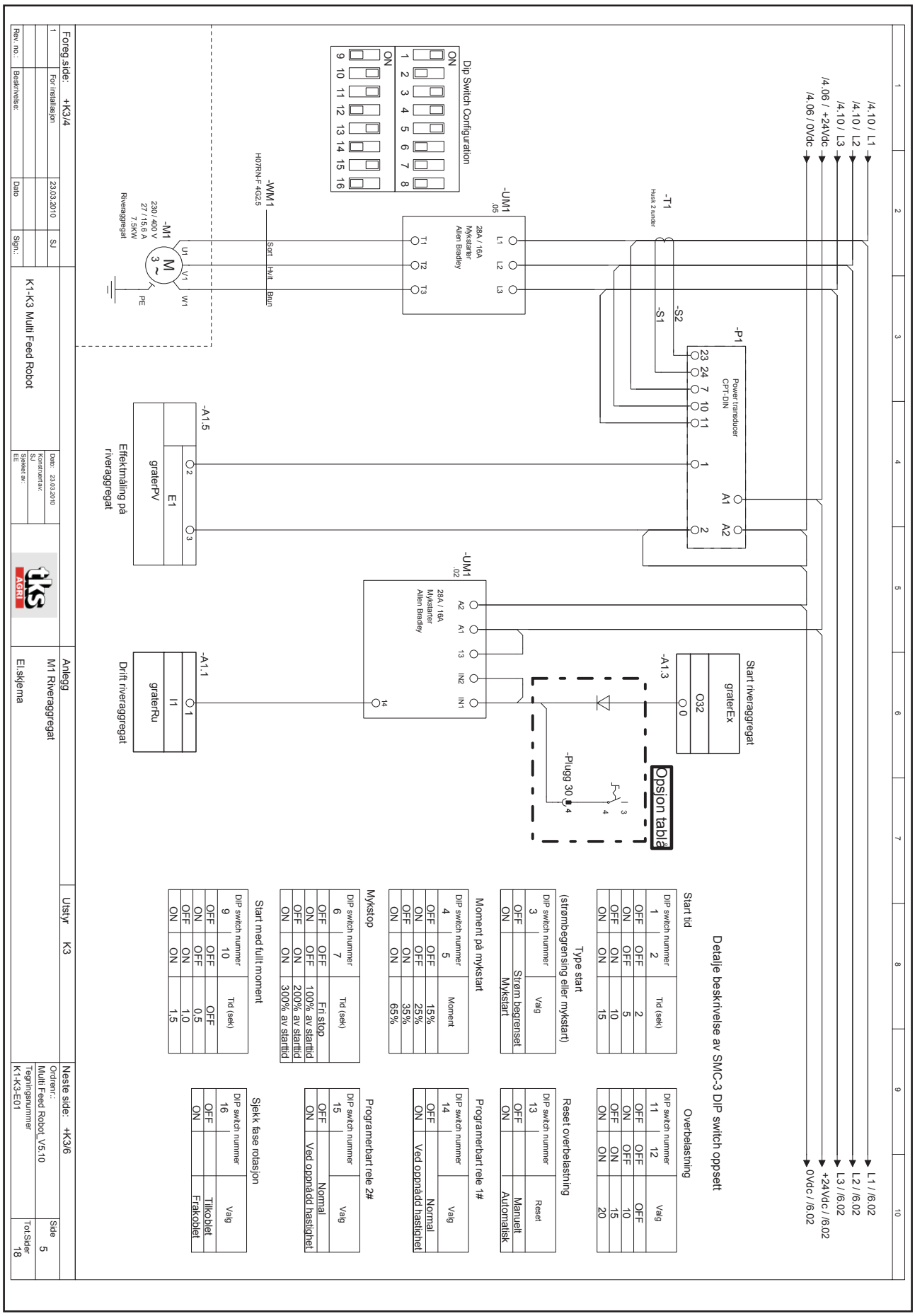
	A1.1	A1.2	A1.3	A1.4	A1.5
Start concentrated feed screw 2				0	
Start concentrated feed screw 3				1	
Pulse concentrated feed screw 1	6				
Pulse concentrated feed screw 2		0			
Pulse concentrated feed screw 3		3			
Concentrated feed tank 1 full	14				
Concentrated feed tank 1 empty	9				
Concentrated feed tank 2 full		2			
Concentrated feed tank 2 empty		1			
Concentrated feed tank 3 full		5			
Concentrated feed tank 3 empty		4			
Zero position sensor 2		10			
Signal strength 1 radio		8			
Signal strength 2 radio		9			
Output selector 1				3	
Output selector 2				4	
Output selector 3				5	
Output selector 4				6	
Output selector 5				7	
Level input				8	
Radio connect				9	
Weight					0 - 1
Emergency stop OK	0				
Manual switch front		6			
Manual switch reverse		7			

5 Circuit diagram

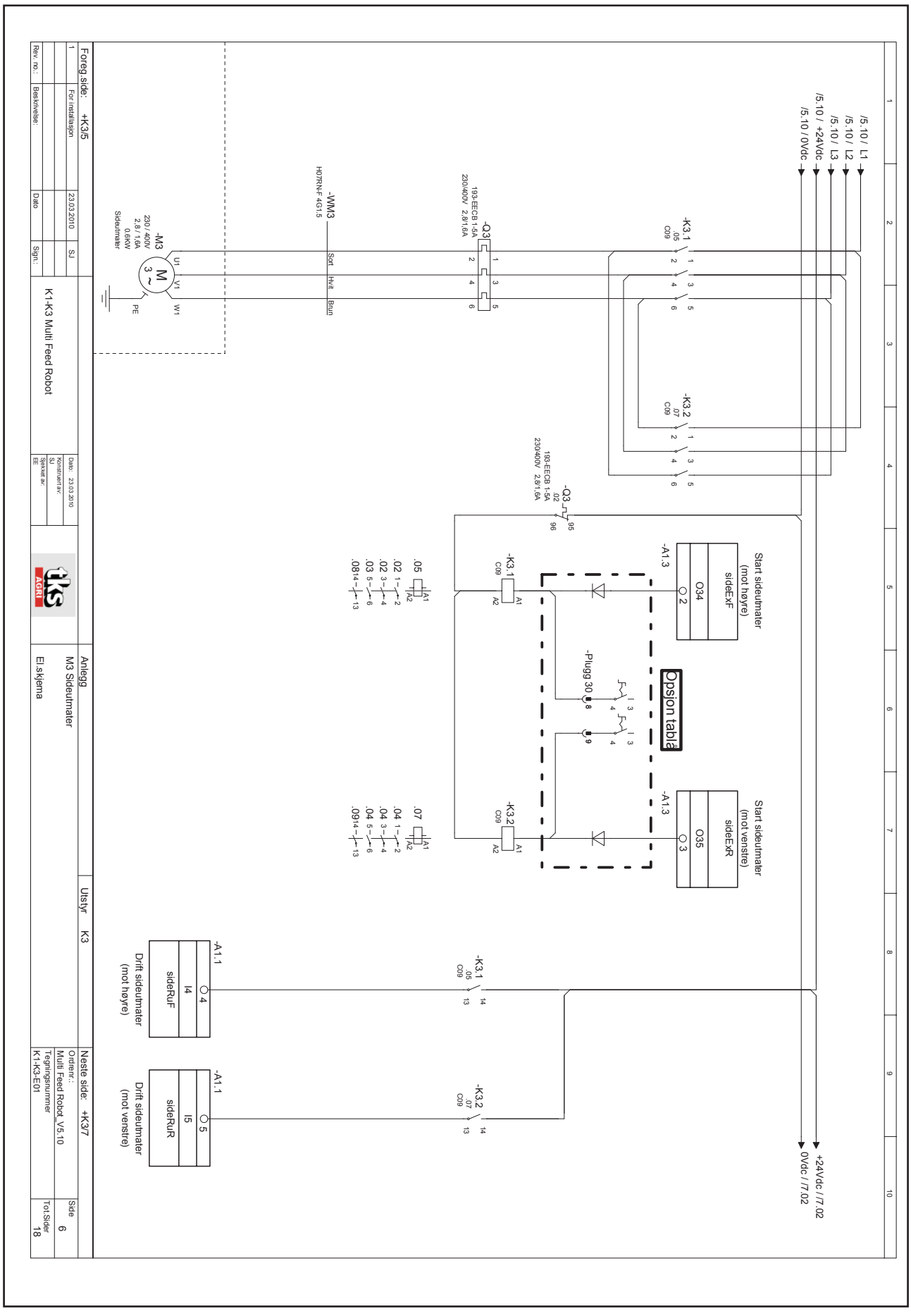
5.1 Circuit diagram for supply and control current 5.xx



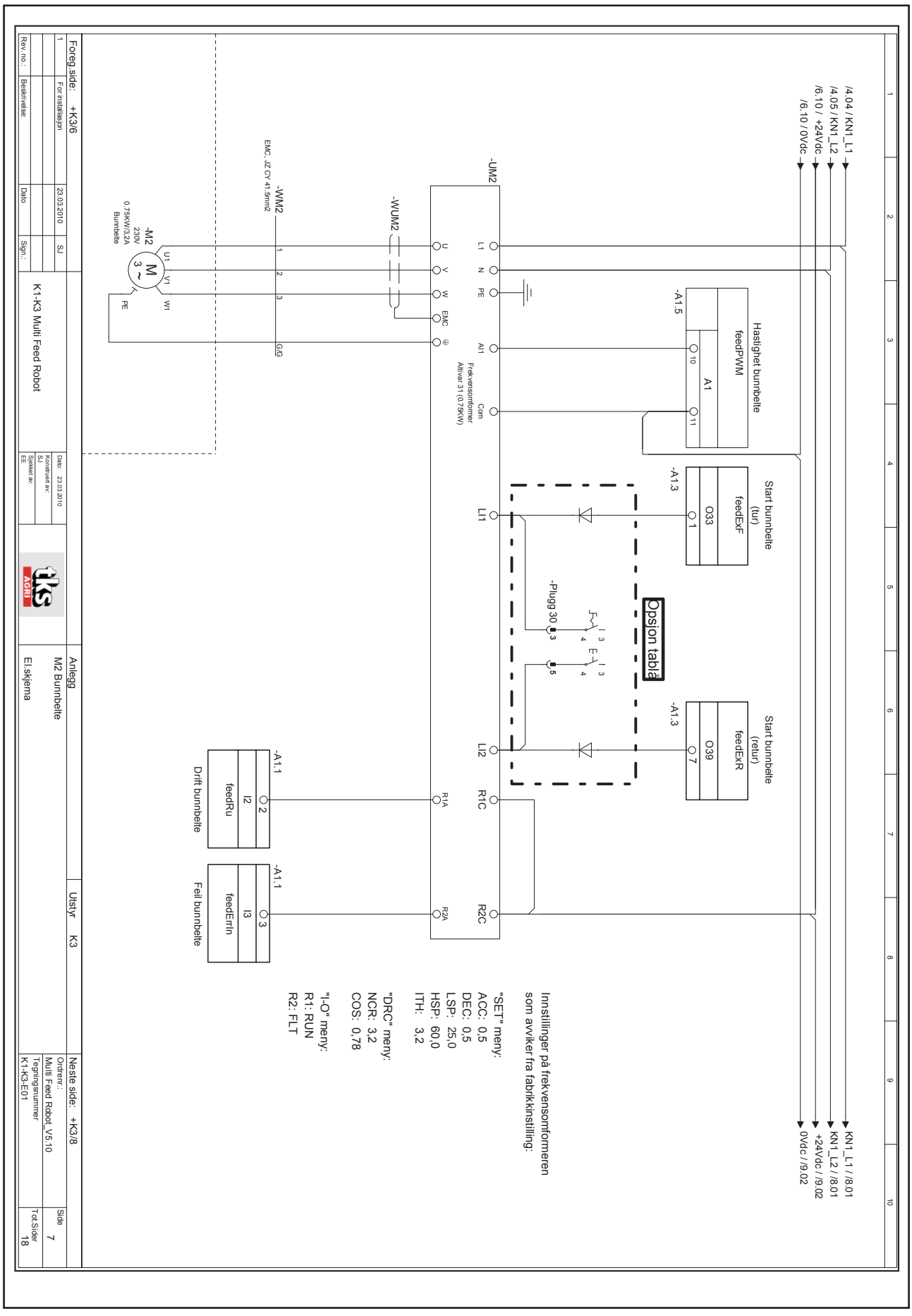
5.2 Circuit diagram for shredder generator 5.xx



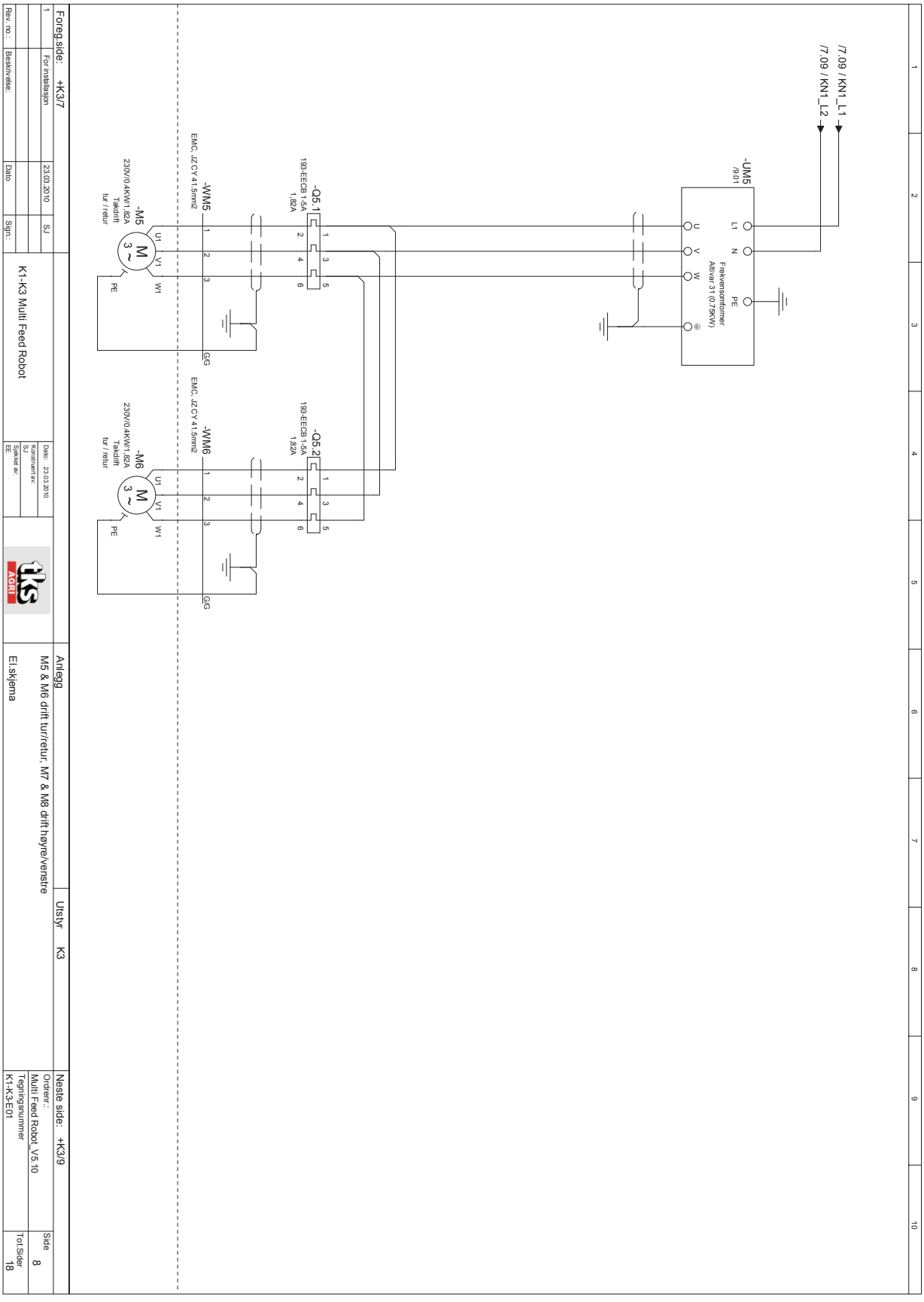
5.3 Circuit diagram for side dispenser 5.xx



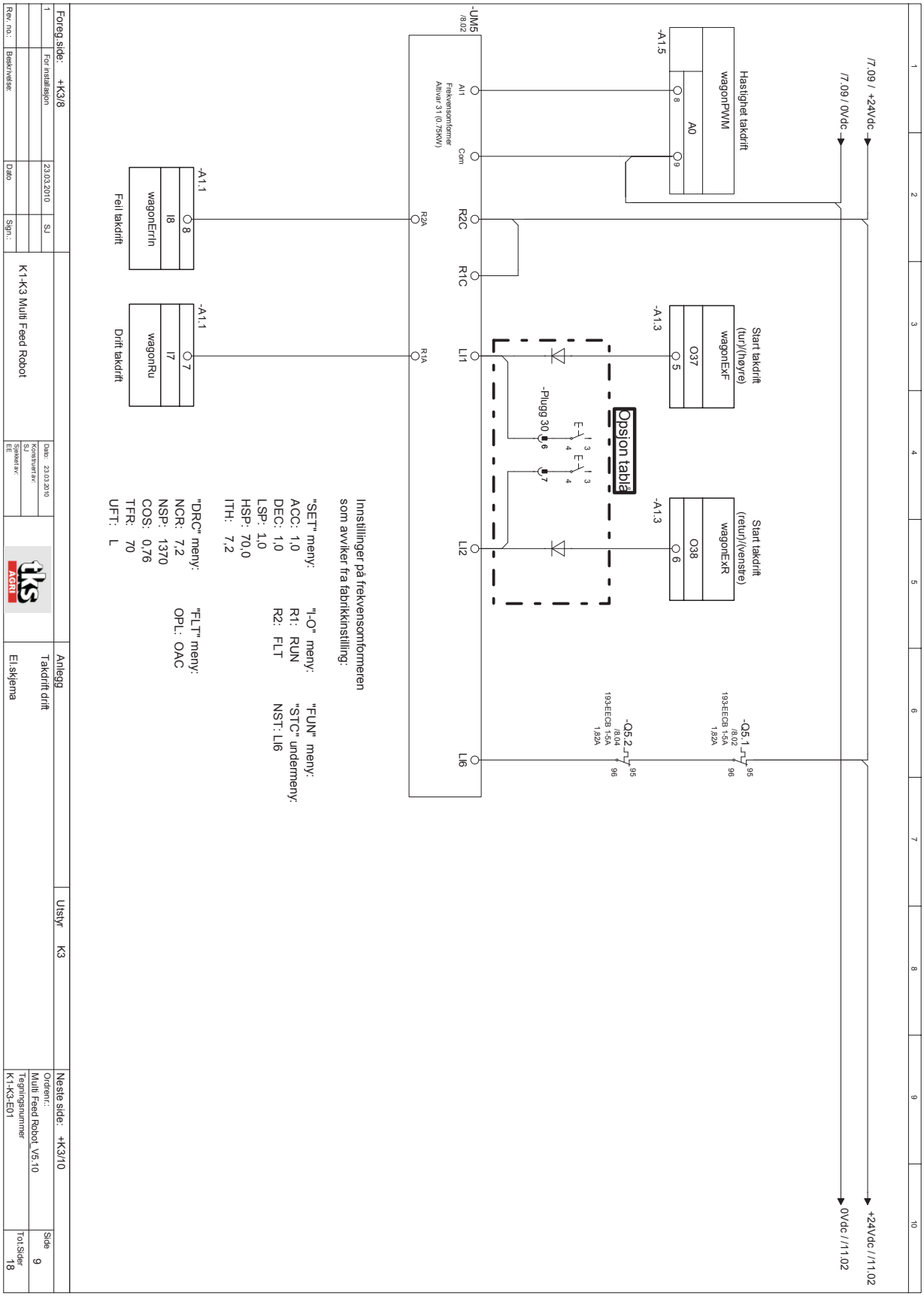
5.4 Circuit diagram for conveyor belt 5.xx



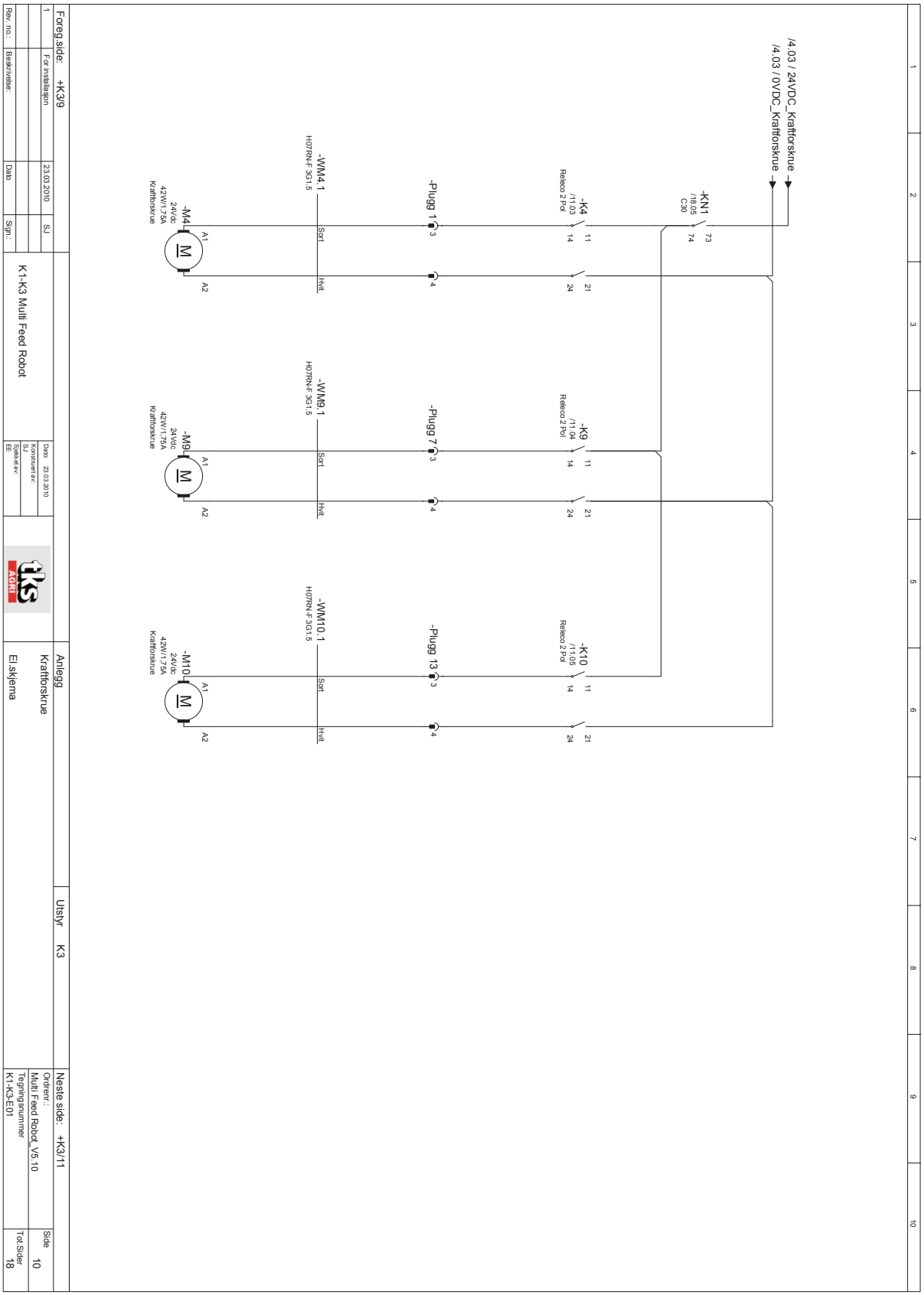
5.5 Circuit diagram for bidirectional operation



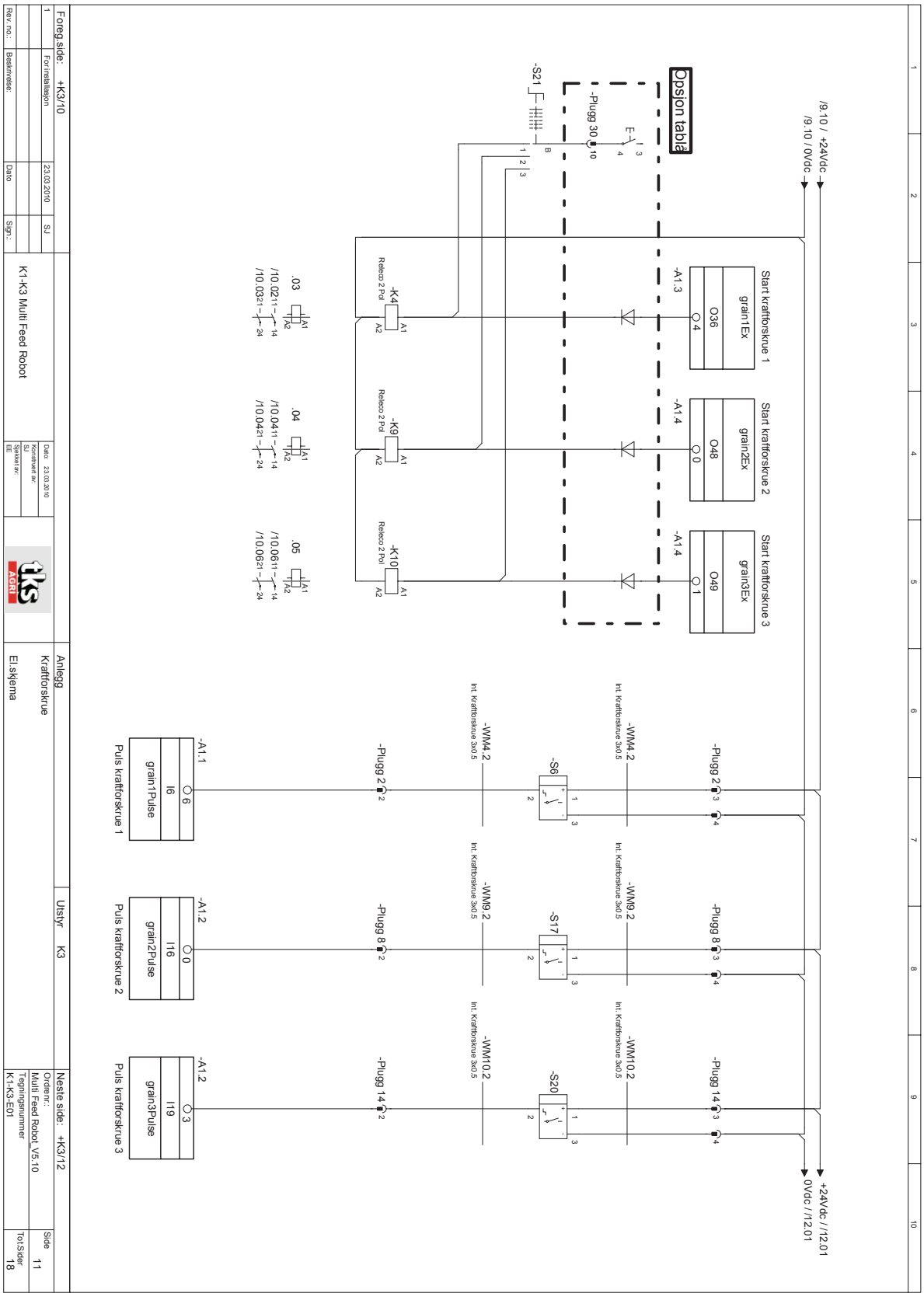
5.6 Circuit diagram for ceiling rail operation 5.xx



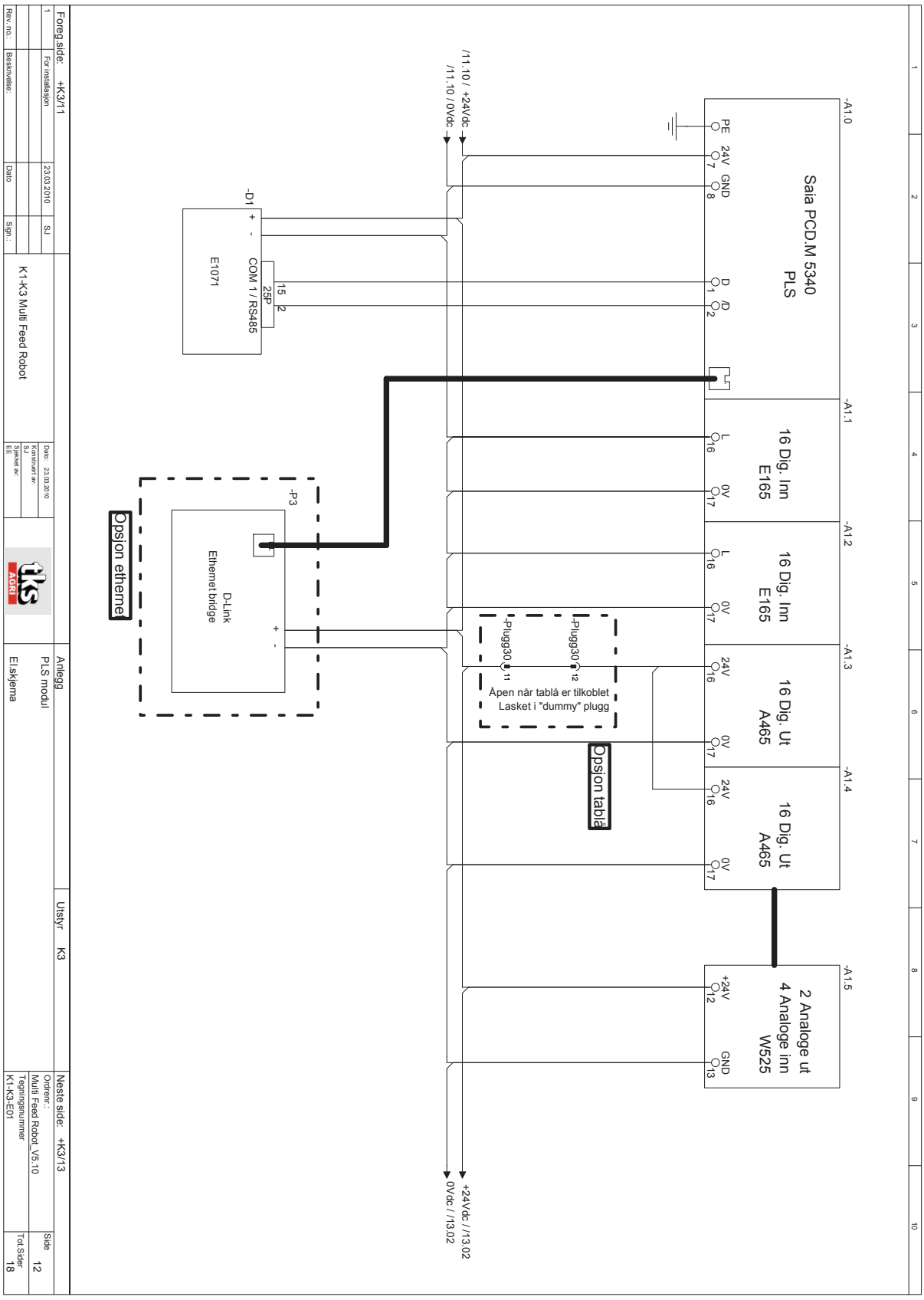
5.7 Circuit diagram for concentrated feed screw



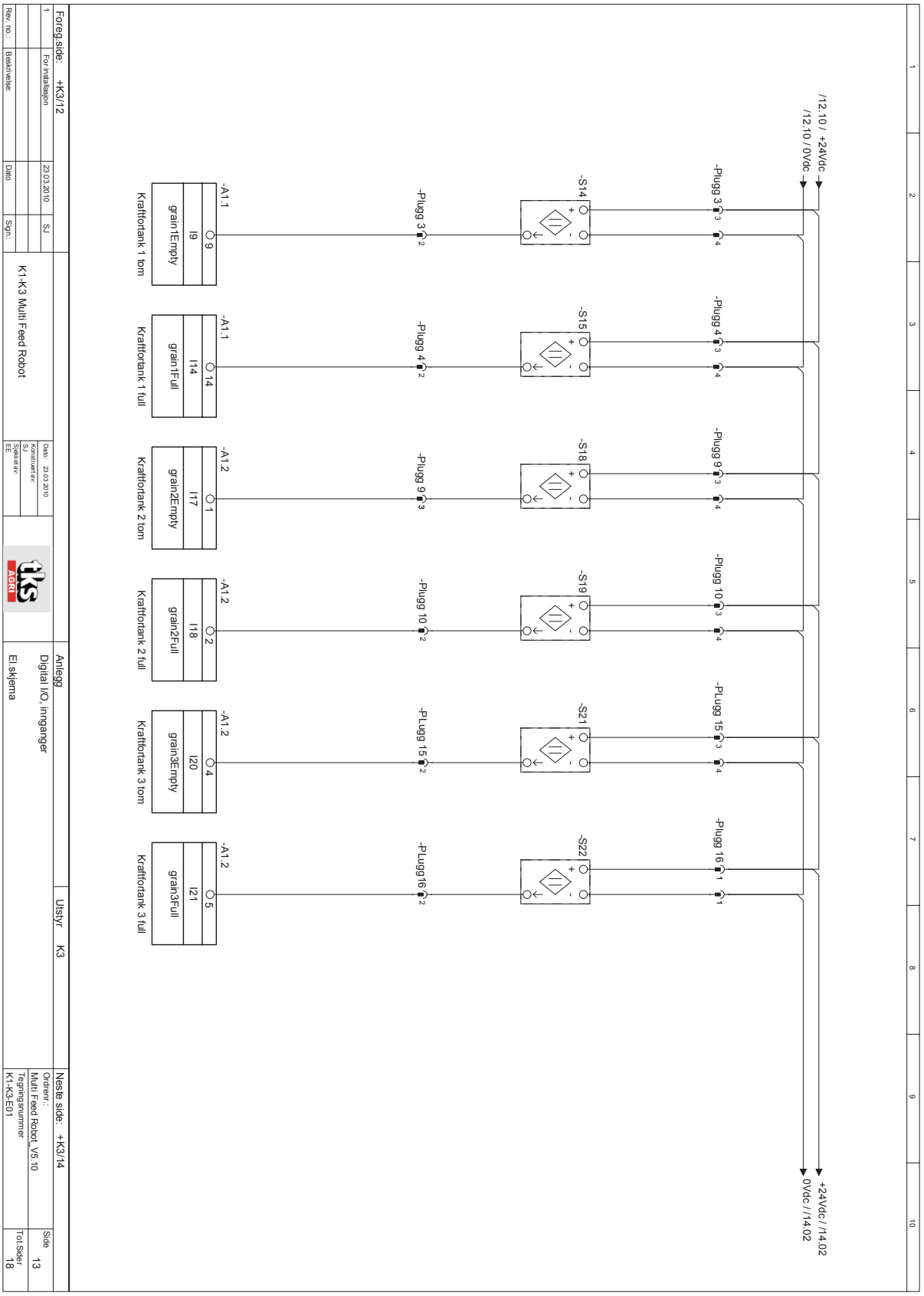
5.8 Circuit diagram for concentrated feed screw



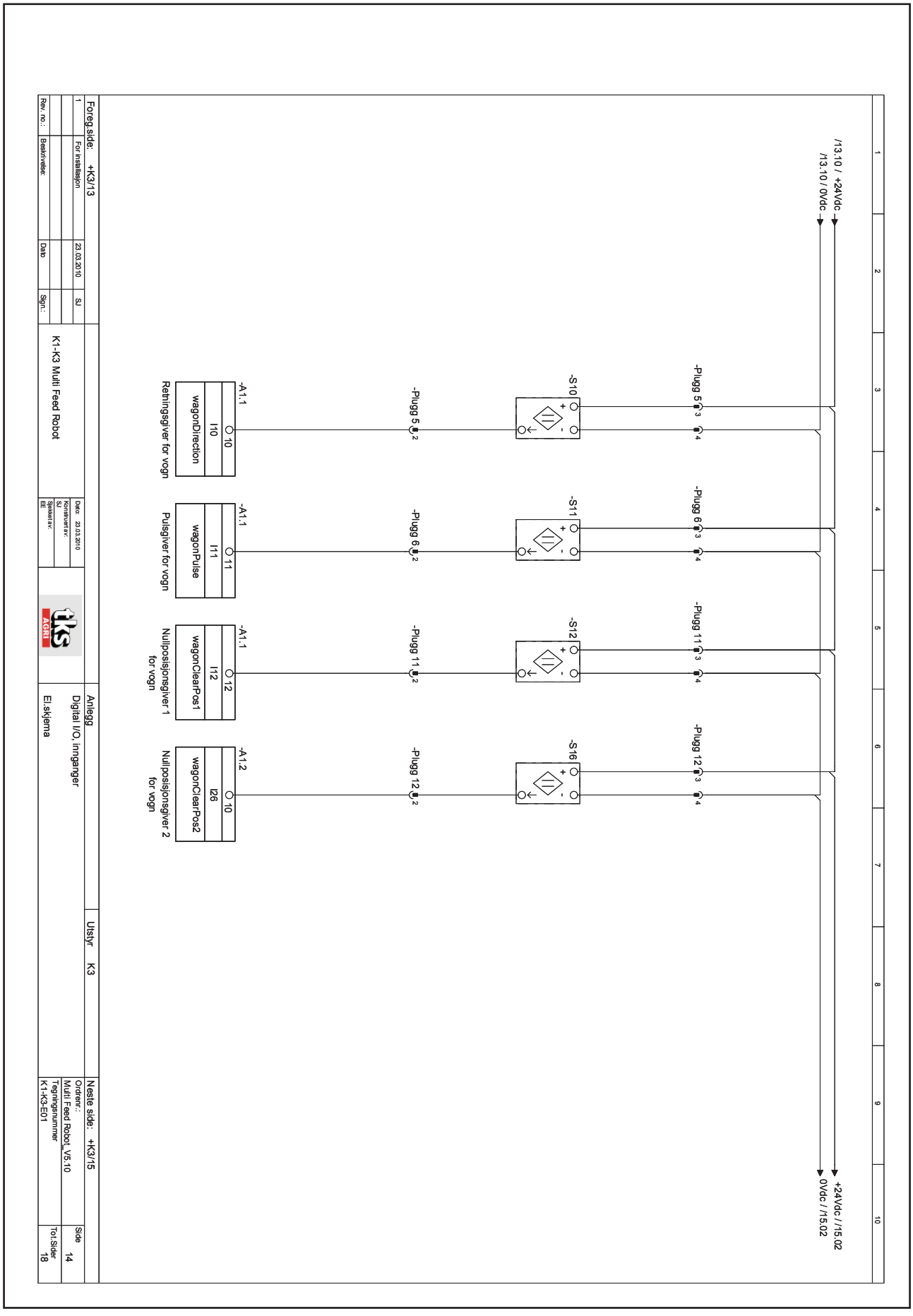
5.9 Circuit diagram PLS module 5.xx



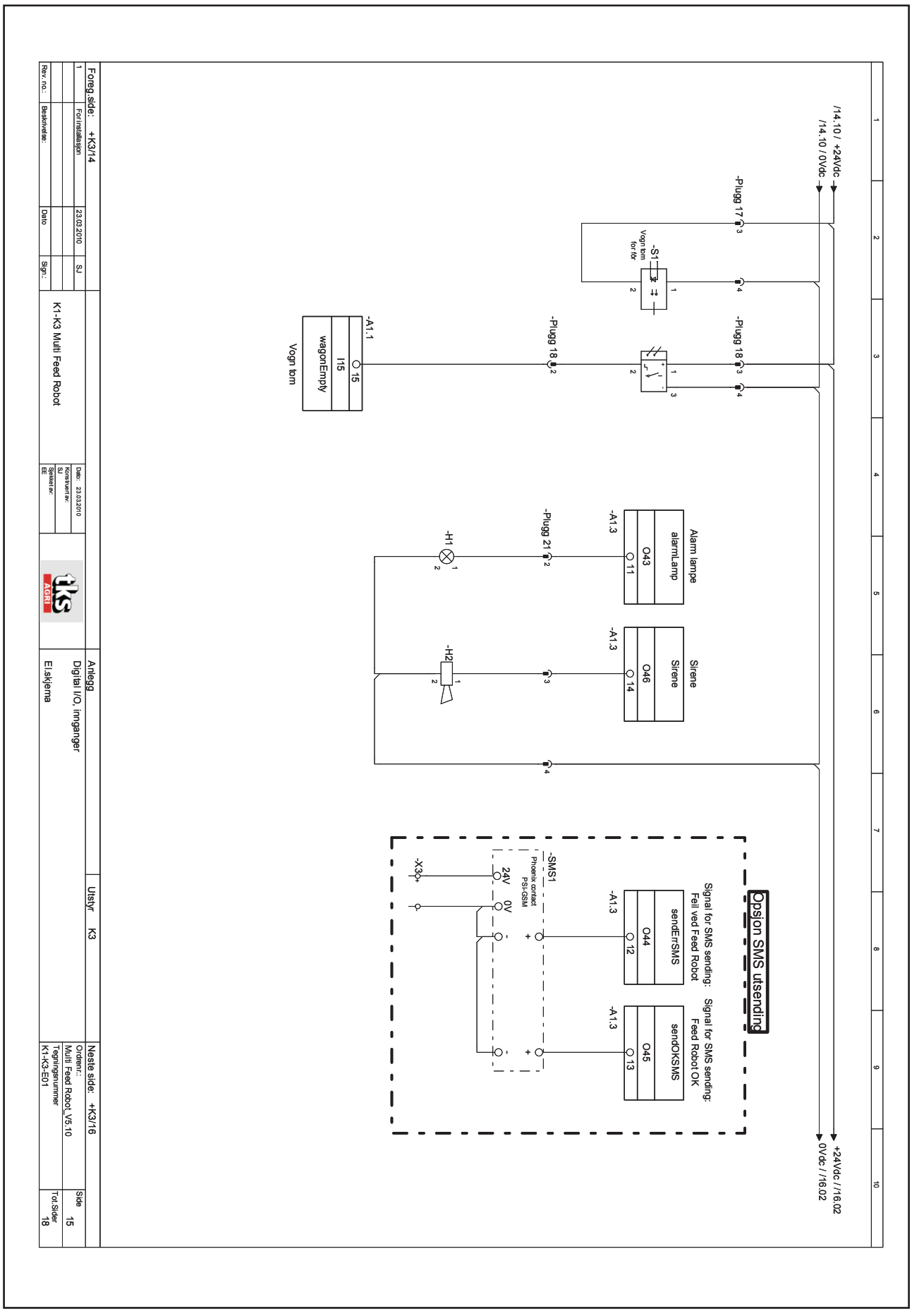
5.10 Circuit diagram for digital I/O inputs 5.xx



5.11 Circuit diagram for digital I/O inputs 5.xx



5.12 Circuit diagram for digital I/O inputs 5.xx

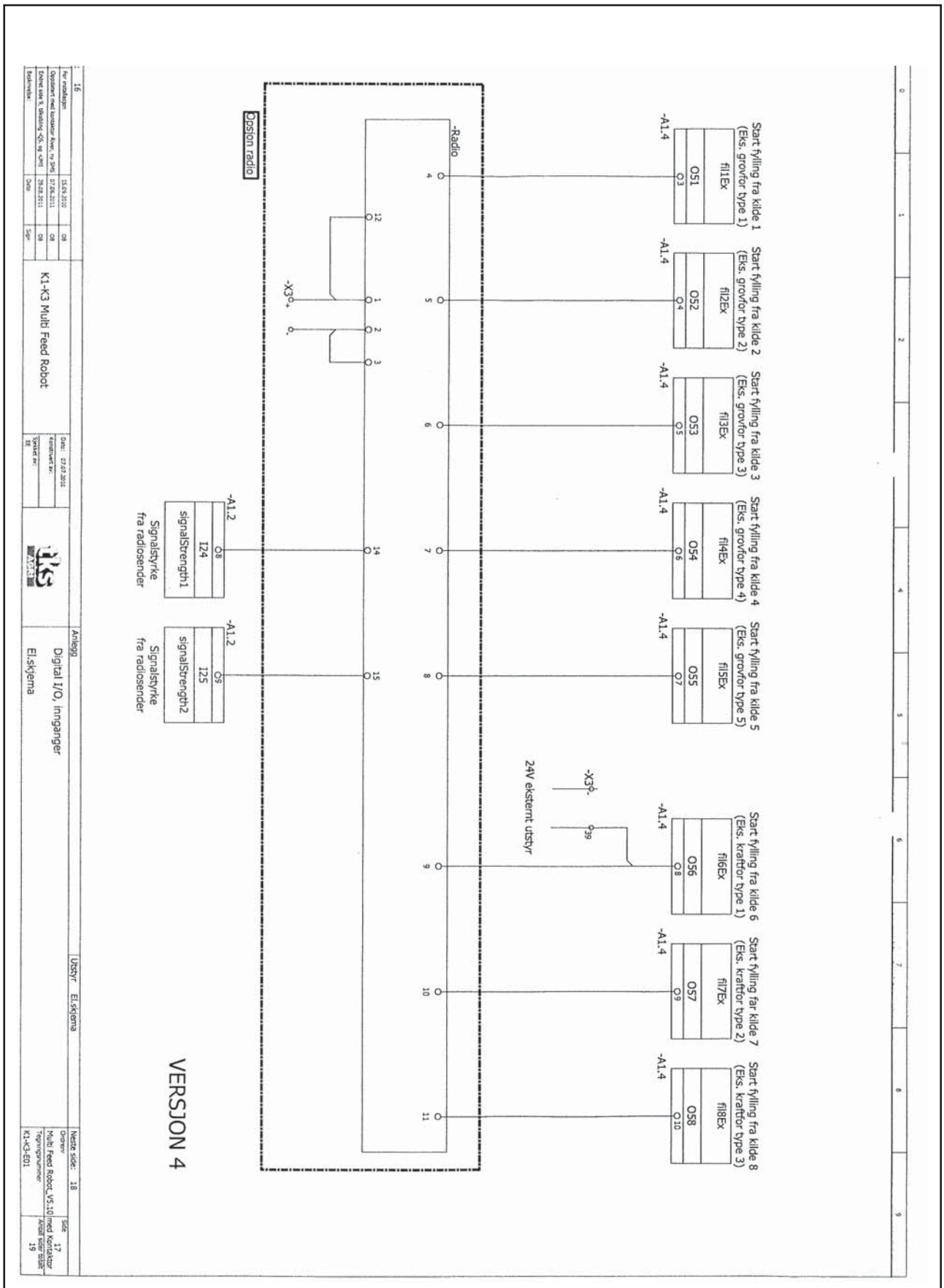


Foreg.side: +K3/14				Anlegg	Utstyr K3	Neste side: +K3/16	
1	For installasjon	23.03.2010	SJ	Digital I/O, innganger		Ordrenr.:	Side 15
				El.skjema		Multi Feed Robot_V5.10	
Rev. no.:	Beskrivelse:	Dato	Sign.:			Tegningsnummer K1-K3-E01	Tot.Sider 18

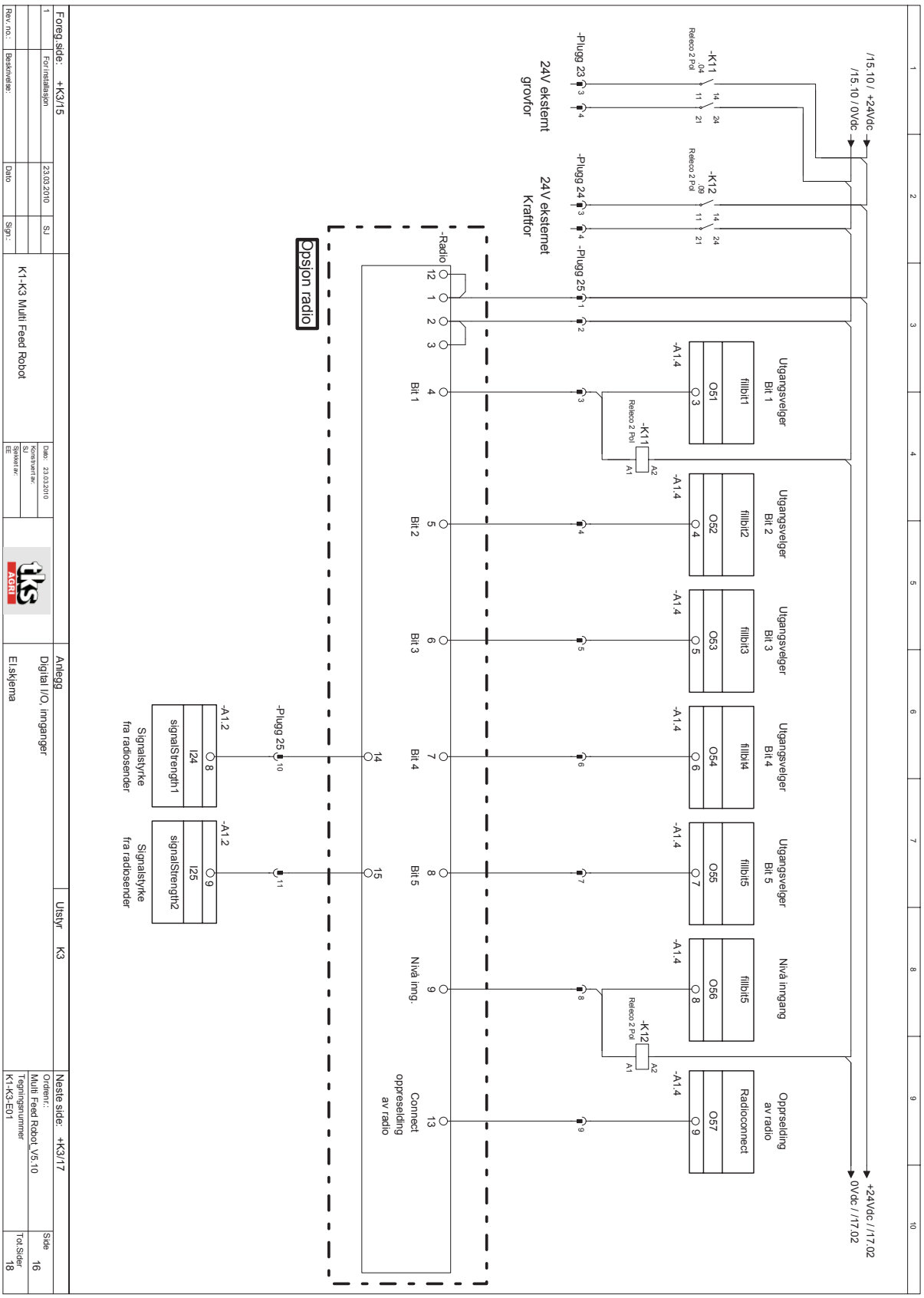
K1-K3 Multi Feed Robot

Dato: 23.03.2010
Konstruert av: SJ
Sjekket av: EE

5.13a Circuit diagram for digital I/O inputs 5.xx



5.13b Circuit diagram for digital I/O inputs 5.xx



Foreg.side: +K3/15 | Neste side: +K3/17

Rev. no.:	Beskrivelse:	Dato	Sign.:
1	For installasjon	23.03.2010	SJ

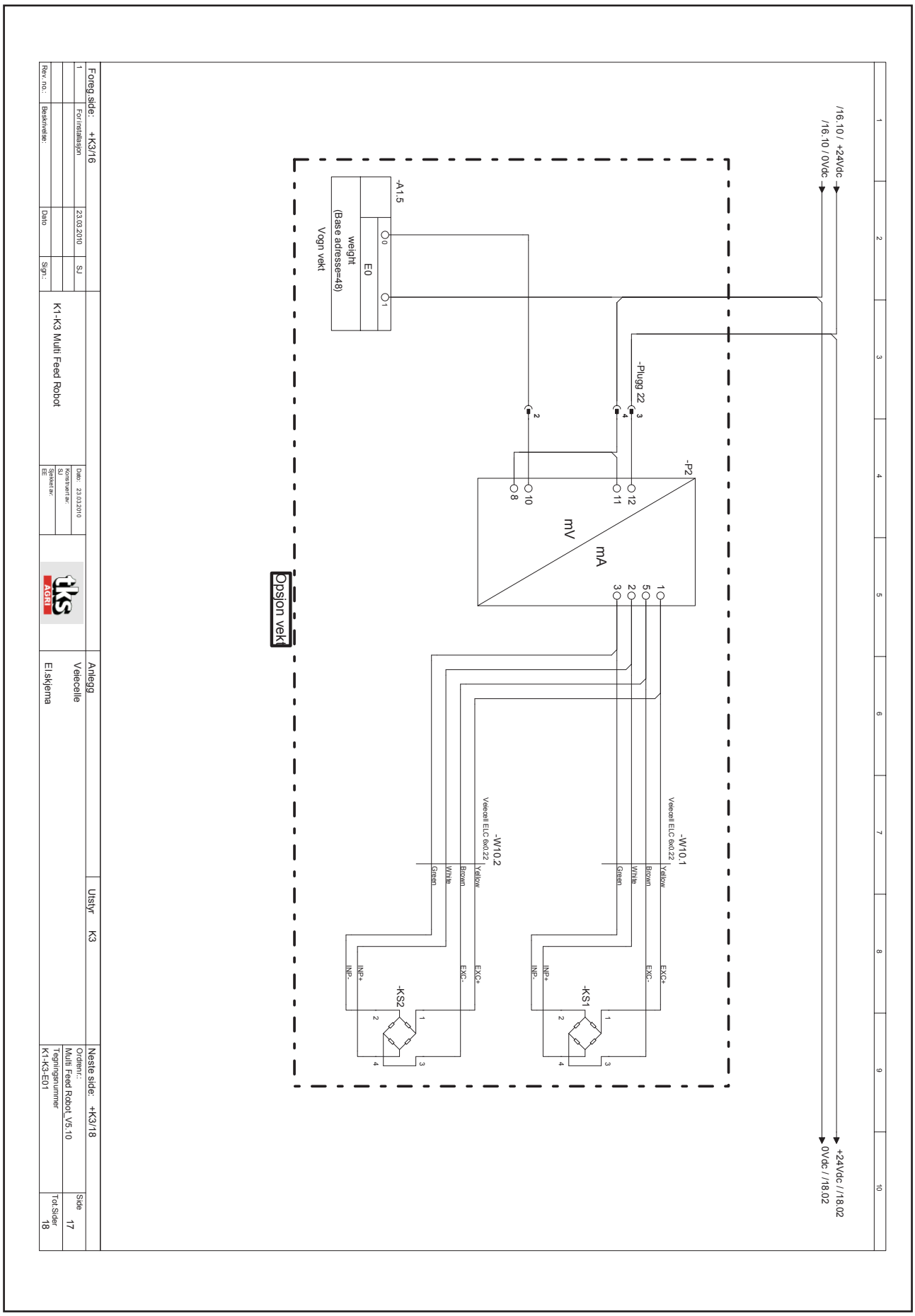
K1-K3 Multi Feed Robot

Dato: 23.03.2010
Konstruert av: SJ
Sjekket av: EE

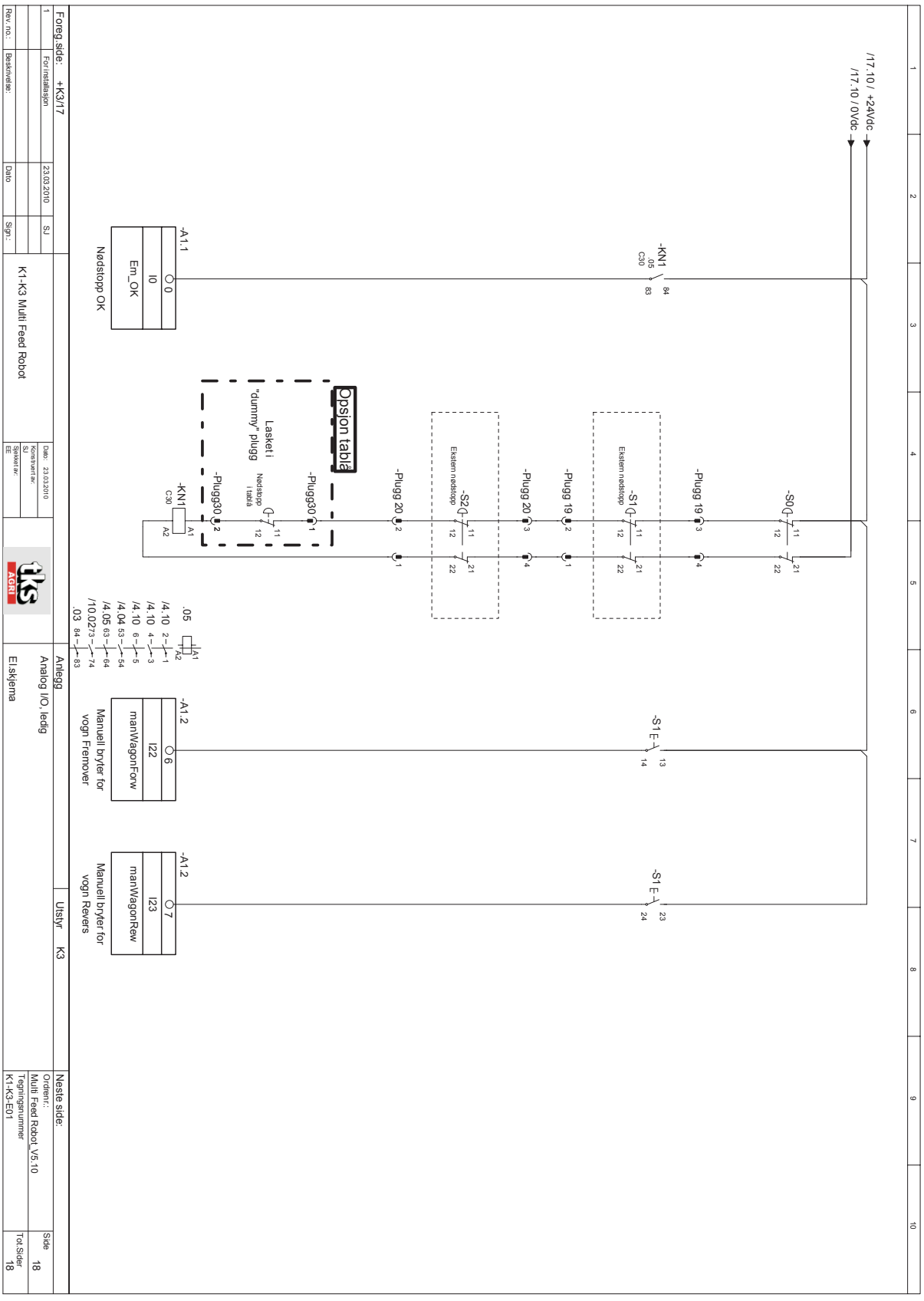
Anlegg: Digital I/O, innganger
Utstyr: K3
El.skjema

Ordrenr.:	Side
Multi Feed Robot_V5.10	16
Tegningsnummer	Tot.Sider
K1-K3-E01	18

5.14 Circuit diagram for weighing cell 5.xx



5.15 Circuit diagram for analogue I/O, free 5.xx



5.16 Circuit diagram - weight box with weighing cell amplifier

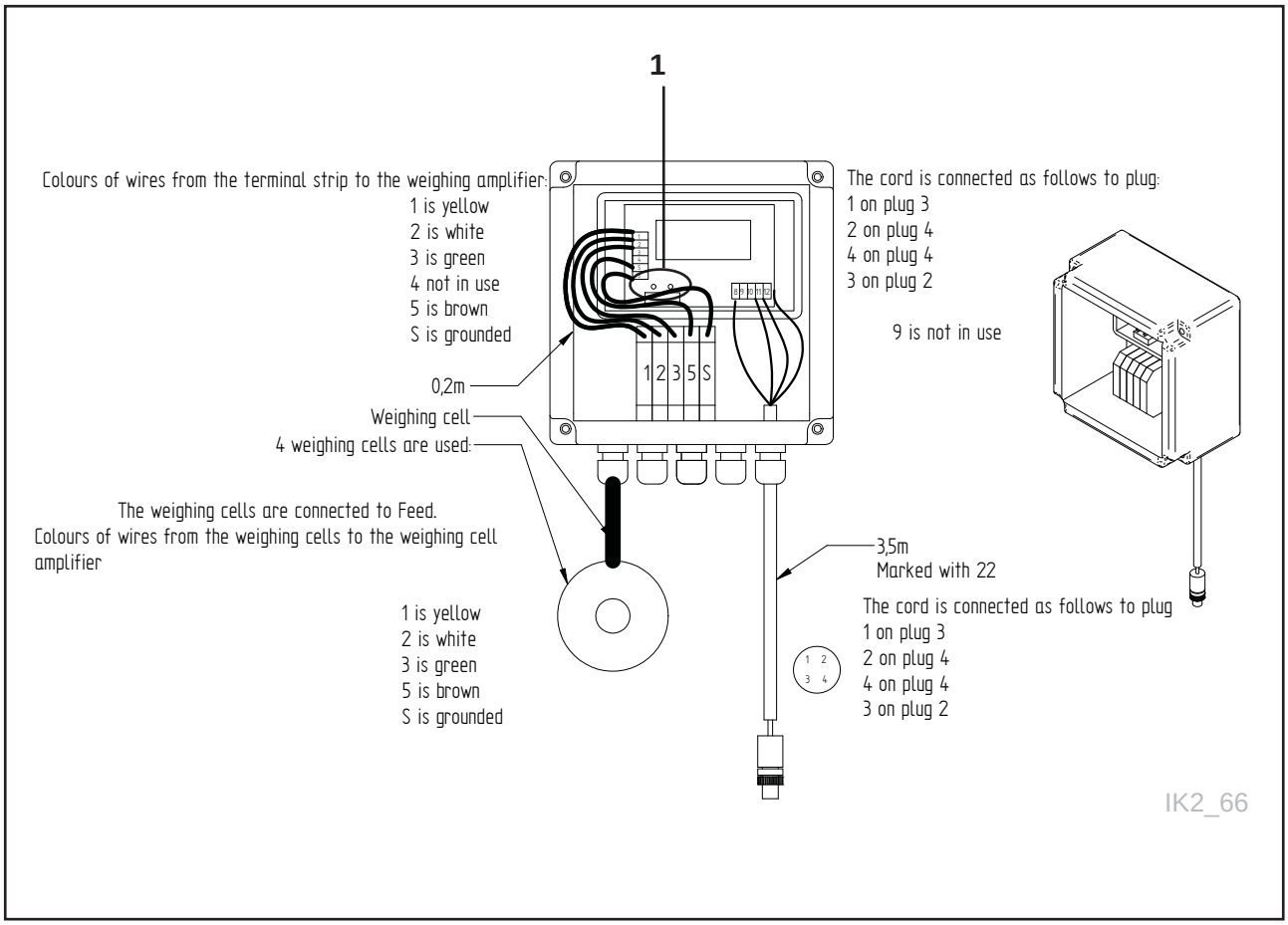

1
Colours of wires from the terminal strip to the weighing amplifier:
1 is yellow
2 is white
3 is green
4 not in use
5 is brown
S is grounded
0,2m
Weighing cell
4 weighing cells are used:
The weighing cells are connected to Feed.
Colours of wires from the weighing cells to the weighing cell amplifier
1 is yellow
2 is white
3 is green
5 is brown
S is grounded
1 2 3 5 S
The cord is connected as follows to plug:
1 on plug 3
2 on plug 4
4 on plug 4
3 on plug 2
9 is not in use
3,5m
Marked with 22
The cord is connected as follows to plug
1 on plug 3
2 on plug 4
4 on plug 4
3 on plug 2
IK2_66

Fig. 86

Configuring the weighing cell amplifier			
Confirm all choices by pressing both keys simultaneously (1) See image above			
Reset by flipping up all dipswitches and pressing both keys simultaneously, then press down all the switches except for no. 8			
Code	**Value**	**Function**	
3	15	Number of measurements	
4	150	Max endring i Kg	
23	4	Maximum change in Kg	
26	1000/2500	Weighing cell capacity 1000 or 2500. See Weighing Cell	
34	U	U=0-10V	
38	1500	Max. display on robot	
24	0,1-2,0	Converts millivolts to Kg	
22	Value	Enter value shown on the display +1000 Kg	
49	14	Faster weight measurement	

5.17 Circuit diagram - control panel radio transmitter

Instructions for connecting to the radio:

- Loop 13 and 1 on radio transmitter, yellow box.

Connect + and - on radio receiver:

- Verify that the light changes its blinking speed.
- Remove loop on radio transmitter, yellow box.
- Measure and test all radio signals on the receiver.

A wire should be run from A1.2, 8 to A1.4, 10 in the K2 FeedRobot operating panel.

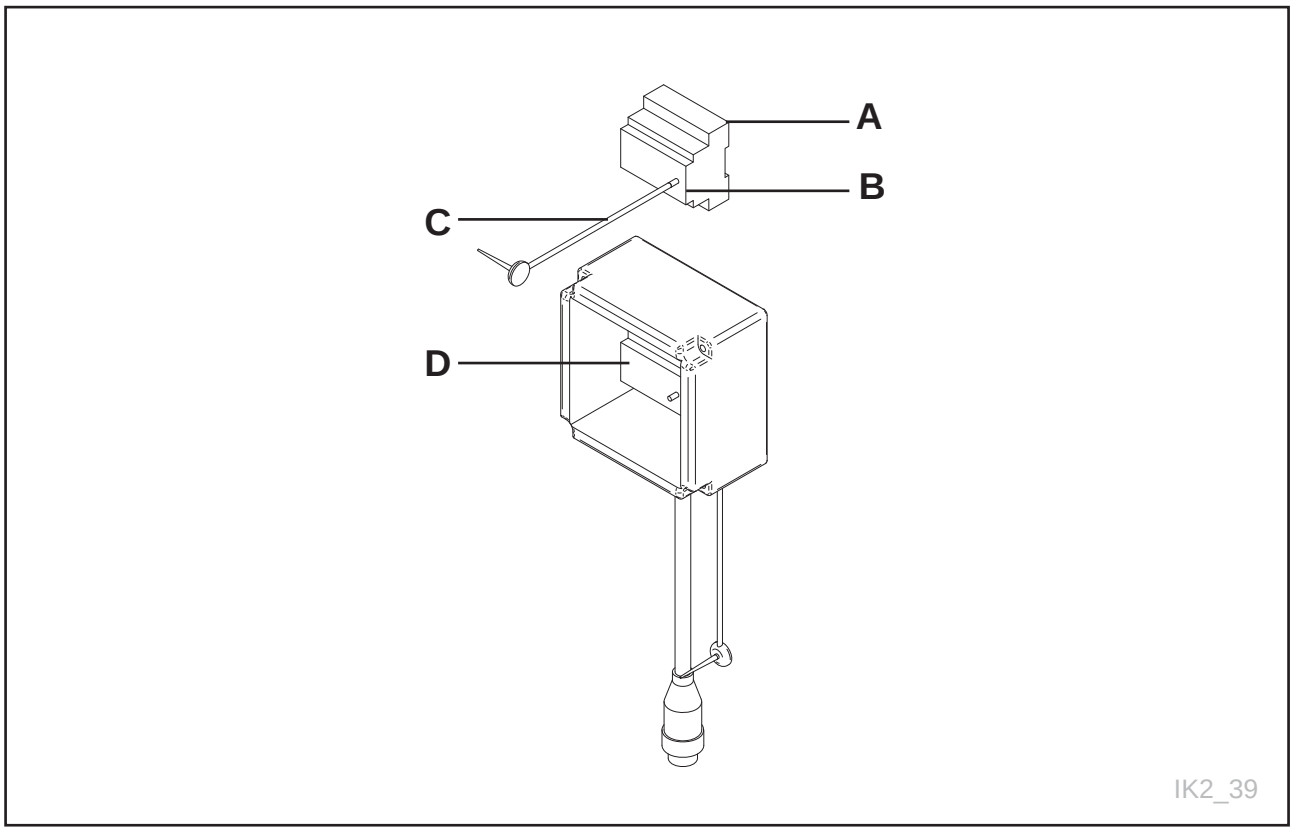


Fig. 87

A Connect in the operating panel with this drawing.
B Radio receiver. White.
Install in operating panel for concentrated feed/feed hopper or mixer robot.
C Connect in the operating panel with this drawing. Yellow
D Radio transmitter. Yellow

Circuit diagram radio transmitter P10SV1-24 (yellow)			
Terminal strip radio transmitter	**Function**	**Explanation**	**Terminal strip radio**
1	Vin	+24VDC	1
2	0V	Earth	2
3, loopes with 2	COM (0V)	Shared	
4	i1	Forage 1	3
5	i2	Forage 2	4
6	i3	Forage 3	5
7	i4	Forage 4	6
8	i5	Forage 5	7
9	i6	Forage 6	8
10	i7	Forage 7	9
11	i8	Forage 8	10
12, looped with 1	i9	Activation radio	
13, connects to 1 on logon	i10	Connect, logon	
14	S0	Signal strength bit 0	
15	S1	Signal strength bit 1	

Circuit diagram radio receiver P9MV1-24 (white)			
Terminal strip radio receiver	**Function**	**Explanation**	
1	Not in use	Not in use	
2	Not in use	Not in use	
3	Not in use	Not in use	
4	Vin	Grounded	
5	0V	+24VDC	
6, loopes with 4	COM	Common	
7	o1	Forage 1	
8	o2	Forage 2	
9	o3	Forage 3	
10	o4	Forage 4	
11	05	Forage 5	
12	o6	Concentrate 1	
13	o7	Concentrate 2	
14	o8	Concentrate 3	
15	oA	Signal	

5.18 Connection of P10SV2-24: Extended

Radio, up to 13 feed types

Terminal strip:

No:	Function:	Explanation:
1	Vin	+ 24VDC
2	0V	Grounded
3	COM (0V)*	Common for all inputs
4	i1	Bit 1 (MSB)
5	i2	Bit 2
6	i3	Bit 3
7	i4	Bit 4
8	i5	Bit 5 (LSB)
9	i6	Level input
10	i7	
11	i8	
12	i9	**Activation of radio**
13	i10	Connect (only for logon)
14	S0	Signal strength bit 0 (gives off 24V)
15	S1	Signal strength bit 1 (gives off 24V)

***Must have lower potential than the inputs.**

Quality control

K2 FeedRobot 1600 and 1200

Owner : _____
Address : _____
Post adress : _____

Sales Company: _____ *Name of sales rep. :* _____
Department: _____ *Name of fitter :* _____
Date of sale : _____ *Order no.:* _____
Date of commissioning: _____

An instructor/fitter who represents the sales company and the owner/user of the equipment must jointly go through these points from the user manual before the equipment is used.

Tick off if OK:

	Have danger zones, crushing risks and the way in which the machine is operated safely been assessed and reviewed?
	Have all safety instructions for the machine been read and reviewed?
	Has the system been suspended and dimensioned in accordance with the structural load tables and regulations?
	Is the pulse wheel correctly fitted, and is it functioning properly (test run performed between resets)?
	Has the transmitter/receiver for the 24 volt signal been properly fitted and verified?
	Is the switch rail with the "carriage end" reservoir correctly configured, with enough overlap?
	Has the placement of the resets been analysed, and has testing/registration been performed?
	Is the reservoir placed at the correct height and is the overlap with the machine OK?
	Are the filling positions for the reservoir/feed hopper and concentrated feed at least 1.5 m from one another?
	Has an exact and cowshed chart been drawn up with all the groups and operating times (not for small groups)?
	Has the user signed a service agreement?
	Are all forward feeding zones on the right side, and all rear feed zones on the left side?
	Does the user understand the significance of and how to configure the following:
	Settings - Bale data
	Settings - Reservoir
	Settings - Conveyor belt
	Has instruction been provided on how to troubleshoot and fix the faults that may occur?
	Have fixed routines for maintenance and inspection of the FeedRobot system been established?
	Are safety chains fitted to 1 rail with traverser carriage?

It is hereby confirmed that the user manual has been followed and reviewed. Training is confirmed as approved by the users and owner.

Signature of owner and user: **Dealer's representative:**

_____ _____

_____ _____

The TKS warranty provisions will only apply when the quality control has been documented as having been completed. A copy must be sent to TKS and the sales rep

Quality control

K2 FeedRobot 1600 and 1200

Owner : _____
Address : _____
Post adress : _____

Sales Company: _____ *Name of sales rep. :* _____
Department: _____ *Name of fitter :* _____
Date of sale : _____ *Order no.:* _____
Date of commissioning: _____

An instructor/fitter who represents the sales company and the owner/user of the equipment must jointly go through these points from the user manual before the equipment is used.

Tick off if OK:

	Have danger zones, crushing risks and the way in which the machine is operated safely been assessed and reviewed?
	Have all safety instructions for the machine been read and reviewed?
	Has the system been suspended and dimensioned in accordance with the structural load tables and regulations?
	Is the pulse wheel correctly fitted, and is it functioning properly (test run performed between resets)?
	Has the transmitter/receiver for the 24 volt signal been properly fitted and verified?
	Is the switch rail with the "carriage end" reservoir correctly configured, with enough overlap?
	Has the placement of the resets been analysed, and has testing/registration been performed?
	Is the reservoir placed at the correct height and is the overlap with the machine OK?
	Are the filling positions for the reservoir/feed hopper and concentrated feed at least 1.5 m from one another?
	Has an exact and cowshed chart been drawn up with all the groups and operating times (not for small groups)?
	Has the user signed a service agreement?
	Are all forward feeding zones on the right side, and all rear feed zones on the left side?
	Does the user understand the significance of and how to configure the following:
	Settings - Bale data
	Settings - Reservoir
	Settings - Conveyor belt
	Has instruction been provided on how to troubleshoot and fix the faults that may occur?
	Have fixed routines for maintenance and inspection of the FeedRobot system been established?
	Are safety chains fitted to 1 rail with traverser carriage?

It is hereby confirmed that the user manual has been followed and reviewed. Training is confirmed as approved by the users and owner.

Signature of owner and user: **Dealer's representative:**

_____ _____

_____ _____

The TKS warranty provisions will only apply when the quality control has been documented as having been completed. A copy must be sent to TKS and the sales rep

Quality control

K2 FeedRobot 1600 and 1200

Owner : _____
Address : _____
Post adress : _____

Sales Company: _____ *Name of sales rep. :* _____
Department: _____ *Name of fitter :* _____
Date of sale : _____ *Order no.:* _____
Date of commissioning: _____

An instructor/fitter who represents the sales company and the owner/user of the equipment must jointly go through these points from the user manual before the equipment is used.

Tick off if OK:

	Have danger zones, crushing risks and the way in which the machine is operated safely been assessed and reviewed?
	Have all safety instructions for the machine been read and reviewed?
	Has the system been suspended and dimensioned in accordance with the structural load tables and regulations?
	Is the pulse wheel correctly fitted, and is it functioning properly (test run performed between resets)?
	Has the transmitter/receiver for the 24 volt signal been properly fitted and verified?
	Is the switch rail with the "carriage end" reservoir correctly configured, with enough overlap?
	Has the placement of the resets been analysed, and has testing/registration been performed?
	Is the reservoir placed at the correct height and is the overlap with the machine OK?
	Are the filling positions for the reservoir/feed hopper and concentrated feed at least 1.5 m from one another?
	Has an exact and cowshed chart been drawn up with all the groups and operating times (not for small groups)?
	Has the user signed a service agreement?
	Are all forward feeding zones on the right side, and all rear feed zones on the left side?
	Does the user understand the significance of and how to configure the following:
	Settings - Bale data
	Settings - Reservoir
	Settings - Conveyor belt
	Has instruction been provided on how to troubleshoot and fix the faults that may occur?
	Have fixed routines for maintenance and inspection of the FeedRobot system been established?
	Are safety chains fitted to 1 rail with traverser carriage?

It is hereby confirmed that the user manual has been followed and reviewed. Training is confirmed as approved by the users and owner.

Signature of owner and user: **Dealer's representative:**

_____ _____

_____ _____

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Notes

TKS is a family owned company with a strong brand name.
We are providing our customers with a unique and complete range of high quality products.

www.tks-as.no

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